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The absence of Aristotelian teleology in some modern European philosophers of nature.

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**THE ABSENCE OF ARISTOTELIAN TELEOLOGY
IN SOME MODERN EUROPEAN PHILOSOPHERS OF NATURE**

**by
Darko Piknjac**

**A Thesis
Submitted to the Faculty of Graduate Studies and Research
through the Department of Philosophy in
Partial Fulfillment of the Requirements for the
Degree of Master of Arts at the
University of Windsor**

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ABSTRACT

THE ABSENCE OF ARISTOTELIAN TELEOLOGY IN SOME MODERN EUROPEAN PHILOSOPHERS OF NATURE

by
Darko Pisknjac

Beginning with Aristotle, many philosophers have for centuries thought it important to consider the ends to which things, whether living or non-living, tend by nature. These ends have come to be known as *final causes* of things. But in the early decades of the seventeenth century we find some philosophers who think it undesirable to consider final causes in physics. Two such philosophers are Francis Bacon and Rene Descartes. In order to find out why they are of this opinion, we will consider and critically evaluate the reasons they give for maintaining their position. Before we do, however, it is important to lay out ancient accounts of final causality so that we can better understand what it is that our modern philosophers banished from their physics. The two accounts that we will consider first are those of Aristotle and St. Thomas Aquinas. Aristotle's account is important because he can properly be called the father of final causality, while Aquinas' account is one of the most influential Christian interpretations of Aristotle. It is also important to consider Robert Boyle on this topic because he is one of the seventeenth-century philosophers who were opposed to Descartes' banishment of final causes. In the course of our evaluation of the treatment of final causes by our three modern philosophers it will become necessary to raise an important question: Do they show a sound understanding of Aristotelian doctrine of finality? If they do not, it cannot really be said that they have offered a criticism worth taking seriously.

**Dedicated to Rev. Gordon Allan,
for Sunday morning glimpses
of things that remain hidden
to them that never look up.**

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My first expression of gratitude goes to Dr. John Underwood Lewis who is one of the key people responsible not only for my philosophical growth, but also for the conception of the love of "first philosophy" or "wisdom" in me. Had it not been for his willingness to sign me into one of his courses at the beginning of my first undergraduate semester at the University of Windsor, when I was fresh out of High School and without a clue about what to study, I doubt I would make philosophy my academic home. I thank him for being one of the few oases in the academic desert.

I also thank Dr. Harry A. Nielsen for showing me that teaching and learning in the classroom can be a very active experience for both teacher and student. His teaching method is indeed an excellent example of the Socratic method of philosophizing, that is, of midwifery.

I am very thankful to the University of Windsor, Philosophy Department as a whole for making it possible to take courses which were in the areas of my interest but not officially offered during my course-work year. I hope the department never abandons this practice, for it makes the studies enjoyable and therefore easier.

Last, but most certainly not least, I thank my parents for their support without which my studies would be a lot less fruitful.

D. P.

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PREFACE

Scholars of modern philosophy will not, for the most part, disagree with me that in the early decades of the seventeenth century there appear philosophers who wish to leave out the consideration of final causes from their physics. That two such philosophers are Francis Bacon and Rene Descartes can hardly be disputed. The scholars will be quick to point out that there were also philosophers in this period, and especially in the late seventeenth and early eighteenth centuries, who were opposed to Descartes' position regarding final causes. Robert Boyle is one of these. Bacon, Descartes, and Boyle are, therefore, the philosophers with whom this thesis is concerned.

If we assume that Bacon and Descartes see themselves in opposition to the Aristotelian and the Scholastic traditions on the topic of final causality, we must pay careful attention to the way they conceive of final causes. In other words, we must ask ourselves: Does Descartes, for example, reveal an understanding of final causes that is different from that of Aristotle? One of my major claims in this thesis is that we should lean toward an affirmative answer to this question. This question, however, does not arise out of vacuum. It is rather a by-product, so to speak, of an attempt to understand why Bacon and Descartes think it necessary to leave out the consideration of final causes from their physics. This attempt is the primary object of my project. Once Bacon's and Descartes' reasons for banishing final causes from their physics are laid out, it becomes necessary to ask the above question.

My main support for answering this question the way I do revolves around two characteristics of finality. Upon consideration of, on the one hand, Aristotle's and Aquinas' texts on finality, and Bacon's, Descartes', and Boyle's on the other,

it becomes clear that for the latter finality is exclusively *extrinsic*, whereas for the former it is also *intrinsic* and *immanent*.

What do we mean by these terms? It is true that matter and form may be labeled as intrinsic causes, and agent and end as extrinsic causes. The reason for this is the fact that, for Aristotle and the Scholastics, matter and form are actual components of an existing thing, while agent and end are seen rather as causes of its coming into existence. So when, in the context of Aristotle's physics, we refer to the final cause as *extrinsic*, we do so because it is not one of the elements constituting its make-up. But, we must at the same time keep in mind that for Aristotle the final cause is, so to speak, in the thing. In other words, it is also *intrinsic*.

This requires an explanation. Aristotle's final cause is not one that merely directs the motion or energy of a thing, it also electrifies or arouses the motion. It does this by awakening in the thing a process toward the realization of that thing's bodily form. Aristotle seems to have conceived of this by observing the development of a thing. To say that something is developing is to say that it moves toward the fulfillment of its bodily form. But it means more than that. Development implies that a thing has in itself a tendency toward the fulfillment of its bodily form. A tulip bulb, for example, grows only because it tends to become a plant. The form of a tulip is therefore the cause not only of its growth toward becoming a full tulip, but also of its growing at all. It is the final cause of the tulip's growth. That is, it is *that for the sake of which* it grows. As such, the form is the object of desire, it causes a thing to move by being its object of desire (*Metaph.* 1072b3).

This is what it means to say that the final cause is in the thing. But when we look carefully at the way Descartes and Boyle, for example, talk about final causes, they always refer to them as God's purposes. There is no mention of forms

in their discussions of finality. An example will help illustrate the difference between the two conceptions of finality. Let us consider a statue and a tulip. A statue has as its material cause the marble out of which it is made, the sculptor as its efficient cause, and the shape, intended by the sculptor, as its formal cause. Its final cause is the purpose the sculptor had in making it. This purpose could be one of many. Maybe the sculptor needed money. By making and selling the statue the needed money could be obtained. It is important for us to note here that the purpose is completely extrinsic. It is in the sculptor and not in the statue. For Descartes a similar scenario can be applied to a tulip with one difference. God takes the place of the sculptor. The final cause of the tulip thus becomes the purpose God intends for it. Here again, it is completely extrinsic because it is in the mind of God.

It comes as no surprise, then, that Descartes' rejection of finality in physics is tied up with our inability to penetrate God's purposes. Boyle's defense of final causes centers around the notion that the ends of God are the ends of the world as a whole, and that these ends display his power, communicate his goodness, and that at least some of them can be known. When our modern philosophers talk about final causes they conceive of them as being in the mind of God. But this kind of talk about final causes is foreign to Aristotle who does not speak much about nature's relation to God. For him, the final cause of a tulip is closely tied up with its intrinsic form. Given what he has to say about God in *Metaphysics* it is unlikely that he attributed purposive activity in nature to God. This dichotomy between Aristotle and our modern philosophers will, I hope, become more apparent through the course of my thesis.

CHAPTER I

THE PRESENTATION OF THE PROBLEM

REFLECTION

When hill, tree, cloud, those shadowy forms
Ascending heaven are seen,
Their mindless beauty I from far
Admire, a gulf between:

Yet in the untroubled river when
Their true ideas I find,
That river, joined in trance with me,
Becomes my second mind.

GEORGE ROSTREVOR HAMILTON, *The Carved Stone*

Introduction

If we define cause (in general) as "that from whose existing another follows"¹, we can then ask what are the things from whose existence the existence of another follows?² According to Aristotle, there are at least four such things or conditions that are necessary, although separately insufficient, to produce an effect. They are matter³, form, agent, and purpose or end. Each of them can properly be called a cause because they are necessary to bring about a change. In the Aristotelian tradition matter is usually referred to as the *material cause*, form as the *formal cause*, agent as the *efficient cause*, and purpose or end as the *final cause*. It may be easier to understand what the four causes are if they are described in the following way and special attention is paid to the key italicized words.

1. St. Thomas Aquinas, *The Principles of Nature*, trans. by Robert P. Goodwin, Macmillan Publishing Co., New York, 1965, p. 17.

2. A. E. Taylor in his *Aristotle*, Dover Publications, Inc., New York, 1955, says that the Greek word Aristotle used for "cause" is *aitia*, *aition*. *Aition* is properly an adjective used substantivally, and means "that on which legal responsibility for a given state of affairs can be laid." Similarly *aitia*, the substantive, means the "credit" for good or bad, the legal "responsibility," for an act. Now when we ask, "what is responsible for the fact that such and such a state of things now exists?" there are four partial answers which may be given, and each of these corresponds to one of the "causes." p. 50

3. At least in the realm of material universe.

1. Material cause: *that out of which* something is made.
2. Formal cause: *that into which* something is made.
3. Efficient cause: *that by which* something is made.
4. Final cause: *that for the sake of which* something is made.⁴

Two points need to be made by way of clarification before we proceed. First, the above definition of cause by St. Thomas contains an emphasis that marks a departure from Aristotle. It is the emphasis on existence. Aristotle's notion of 'efficiency', for example, "is always associated with motion or matter, and never with existence. One should carefully note that "efficient" cause is not to be taken as implying any order to an existential act. It denotes in Aristotle merely a source of motion and a principle opposed to passivity and to matter."⁵ In *Physics* (194b 23) he defines cause as "that out of which a thing comes to be and which persists." Secondly, Aristotle did not use the adjectives, material, formal, efficient, and final. Owens tells us that this terminology was introduced later by Alexander of Aphrodisias (ca 200 A. D.). "As the four traditional terms are Greek and Peripatetic in origin, and have become the standard way of referring to the Aristotelian causes, they can perhaps be retained without serious objection. Aristotle's own terms for the different causes are often awkward in English, and may sometimes be misleading."⁶

The four causes are really answers Aristotle gives to four questions that arise out of our inquiry about the changes we encounter in our common experience. The four questions are: What is something going to be made⁷ of?. What is it that is being made?. Who (or what) made it?, and What is it being made for? or Why is it

4. I am quoting these four sentences from Mortimer J. Adler's *Aristotle for Everybody*, Macmillan Publishing Co., New York, 1978, p. 42.

5. Joseph Owens, *The Doctrine of Being in Aristotelian "Metaphysics"*, Pontifical Institute of Medieval Studies, Toronto, 1978, p. 176, n. 61.

6. *Ibid.*

7. This holds true for artificial as well as natural things.

being made? Aristotle thought that asking these questions is important for both the study of human production as well as the workings of nature. If natural sciences like physics, biology, chemistry, belong to the type of inquiry that seeks answers about the workings of nature by investigating its causes, then asking all four of the above questions is of utmost importance to the scientist.

The Problem

I do not pretend that what I have to say in this section of the chapter is even remotely original. Having never done any natural science, I am unable to philosophize about it on my own. As R. G. Collingwood points out, "A man who has never enjoyed a certain type of experience cannot philosophize about it; a philosopher who has never studied and worked at natural science cannot philosophize about it without making a fool of himself."⁸ That is why I am going to rely, for most of this section, on E. A. Burtt⁹, who I trust is qualified to philosophize about natural science.

An objection may perhaps be raised to my using only Burtt's work. I do not wish to give the impression that, in my opinion, his is the last word on this topic. I am aware of other works that do not describe early modern science in the same way. Some would disagree with Burtt more strongly than others. But none, I think, would disagree that seventeenth-century science is considerably different from the science of the ancients. More importantly, none would say that the moderns do not differ radically from the ancients with respect to final causality. I am using Burtt here, and could just as easily have used many others, to paint a

8. R. G. Collingwood, *The Idea of Nature*, Oxford University Press, London, 1945. p. 3.

9. I am referring to Burtt's *The Metaphysical Foundations of Modern Science*, Doubleday & Company, Inc., Garden City, N. Y., 1954.

very rough, and no doubt a disputable, sketch of the direction modern science was taking.

The main characteristic of this direction is its insistence on studying nature primarily through the principles of mathematics and geometry. One of the results of this insistence is the exclusion of teleology from the newly conceived physics. In this chapter I wish only to point out the absence of final causality from the philosophy of nature of some early modern philosophers. Burtt's book is one of many that are helpful.

Up until the seventeenth century, scientists, or natural philosophers as they were then called, have for the most part thought that all four questions are important for their kind of inquiry. But in the early 1600's there appeared natural philosophers who no longer considered the questions about the purpose or end of things as proper for their inquiry. "The charters of the many scientific societies and academies that sprang up throughout Europe during the seventeenth century usually contained clauses forbidding purely theological or political discussion and establishing that the group would not investigate "ultimate" or "final" causes."¹⁰

The three figures largely responsible for the direction that modern science took are Copernicus, Kepler, and Galileo. For our purposes it will be best to focus on some of Galileo's doctrines¹¹ in order to see why the teleological outlook had to give way to a mechanical one, that is, to a view that, first, all valid explanations of the material universe can only be given in terms of tiny, basic units that are always in consistently changing relations, and second, that causality resides in the mathe-

10. S. Chodorow, M. Knox, C. Schirokauer, J. Strayer, and H. Gatzke, *The Mainstream of Civilization*, Harcourt, Brace, Jovanovich, Publishers, New York, 1989, p. 597.

11. The reason for this is that in Galileo we find not only a further development of Copernicus' and Kepler's doctrines, but also some notable additions that go well beyond the philosophy of his predecessors. Galileo's doctrines also seem very important for the development of some of the subsequent philosophies, like that of Descartes for example.

matically expressible motions of atoms.

There are at least three important factors emerging from Galileo's works that contributed to the rejection of the scholastic teleology and the formation of the radically new view of the universe. These are the conviction that the material universe can best be understood through the study of bodies in motion, the substitution of time for the old Aristotelian categories of potentiality and actuality, and the positive conception of causality with which Galileo replaced the rejected teleology of the scholastics.¹²

Having devoted himself primarily to the study of *bodies in motion* using the method of exact mathematics, Galileo had, for the first time, embarked on a type of inquiry where the main object of analysis was the question concerning *how* bodies move. This marked a definite abandonment of final causality as a principle of explanation; it was no longer serviceable. In the Aristotelian tradition where the primary object of analysis was to answer *why* things move rather than *how* they move, the principle of final causality was absolutely essential. Galileo thus found it necessary to replace the teleological terminology with a new one.

12. "Scholasticism" is a many-layered concept, and for that reason it is often poorly understood and misused. The name "scholasticism" refers to the "scholarly" aspect of mediaeval philosophy which had to pull together, in an orderly fashion, the vast accumulation of ancient wisdom and patristic theology that it inherited. See Josef Pieper, *Scholasticism*, Pantheon Books, Inc., New York, 1960, pp. 23-24.

In *Dictionary of Philosophy*, ed. by D. D. Runes, New York, 1942, contributors give a lengthy and detailed account of the term. "Scholasticism is both a method and system of thought." What differentiates Scholastic from non-Scholastic philosophy is that, unlike "ancient philosophy which was the philosophy of a people and modern philosophy which is that of individuals, nations and peoples, it was the corporate product of social thought, and as such its reasoning respected authority in the forms of tradition and revealed religion. *Tradition* consisted primarily of Plato and Aristotle as sifted, adopted, and absorbed through many centuries." The main characteristic of the Scholastic method is that "*philosophy is directly and immediately subordinate to theology.*" pp. 280-281. Italics Runes'.

In *A Dictionary of Philosophy*, ed. by Antony Flew, Pan Books, Ltd., London, 1979, contributors point out that "the roots of the term 'scholasticism' stretch back to the Greek word for leisure, since it was recognized from antiquity that for the contemplation of ultimate reasons for things, leisure is an essential condition." p. 315 See also J. Pieper, *Leisure the Basis of Culture*, Pantheon Books, New York, 1952.

The new terminology would express the *process of motion itself* and that in such a manner as to give mathematics a foothold in the phenomena. This was to him an essential part of the first step in his scientific method, the intuitive perception in a group of facts, of such elements as, quantitatively combined would produce the facts observed. . . . Galileo's problem was nothing less than the creation of a new mathematical science to replace the idealistic physics of the scholastics. Naturally enough, the principle on which he developed the new terminology was the conservative one of taking terms of common parlance which as yet had no precise significance, such as force, resistance, moment, velocity, acceleration, and the like, and giving them an exact mathematical meaning, *i.e.*, defining them in such a way that they could take their place beside the definitions of lines, angles, curves, and figures, that mathematicians were already familiar with.¹³

Galileo's new terminology had some important consequences for the metaphysics of modern science. A study of *how* bodies move necessarily involves the concepts of *space* and *time*. This, by itself, was not something new. The ancient astronomers were well aware of the importance of *space* and *time* for their inquiries. But they kept their considerations of space and time quite separate from metaphysics. For Galileo, physical space became identical with the geometrical realm, and physical motion took on purely mathematical concepts.

Hence in the metaphysics of Galileo, space (or distance) and time become fundamental categories. *The real world is the world of bodies in mathematically reducible motions, and this means that the real world is a world of bodies in space and time.* In place of the teleological categories into which scholasticism had analyzed change and movement, we now have these two formerly insignificant entities given new meanings as absolute mathematical continua and raised to the rank of ultimate metaphysical notions.¹⁴

With nature understood in formally mathematical terms, the doctrine of the primary and the secondary qualities had taken on a new form. John Locke's distinction between primary and secondary qualities, which is the direct result of his empiricism, is helpful to us here even though it did not appear until several decades after Galileo. It goes as follows:

These I call *original* or *primary qualities* of body; which I think we may observe to produce simple *ideas* in us, viz. solidity, extension, figure, motion or rest, and number. Secondly, such *qualities* which in turn are nothing in the objects themselves but powers to produce various sensations in us by their *primary qualities*, *i.e.* by the bulk, figure, texture, and motion of their insensible parts, as colours, sounds, tastes, etc. These I call *secondary qualities*.¹⁵

13. Burt, *The Metaphysical Foundations*, pp. 91-92.

14. *Ibid.* p. 93. Italics Burt's.

This newly formed doctrine of primary and secondary qualities established a fundamental step toward eliminating the human person¹⁶ from the world as it was now understood. Because Galileo regarded the study of secondary qualities as subjective and easily prone to error, he placed the real world in the realm of primary qualities. But man could not be regarded as properly suited to mathematical study, having a life of colours, sounds, emotions, aspirations, and desires. The real world must, therefore, lie outside man. It is a world of astronomy with its terrestrial objects in motion and at rest. Man's only relation to the real world is his ability to discover it, and *it* is of greater value than he is. Thus, for example, sight, the most excellent of man's senses, is valuable only because of its object; light. Light is something infinite, while sight is only finite and perishable. Man, in the final analysis, is not much more than a collection of secondary qualities, and as such merely a spectator of the great mathematical system.

Another important factor that contributed to the new scientific outlook is Galileo's substitution of the new entity of time for Aristotle's categories of potentiality and actuality. Those two categories were of enormous help to the ancients in their attempts to understand change in the material universe. They understood the temporal process as a continuous transformation of potentiality into actuality. This method of analysis, in addition to making the transformation of an acorn into an oak tree intelligible, enabled the ancients to see a logical continuity between

15. John Locke, *An Essay Concerning Human Understanding*, ed. by J. W. Yolton, J. M. Dent, London, 1976. p. 58.

16. The expression "human person" is not redundant. We must keep in mind that "a person", according to Boethius, and I have not seen a better definition, is "the individual substance of a rational nature." (*A Treatise Against Eutyches and Nestorius*, trans. by H. F. Stewart, E. K. Rand, and S. J. Tester in *Boethius: The Theological Tractates: The Consolation of Philosophy*, Harvard University Press, Cambridge, Massachusetts, 1973. p. 85.) Because a human being is not the only possible kind of the individual substance of a rational nature, God and the angels are also rational natures, it is possible to talk about human persons.

such a transformation and “the union with God in the religious ecstasy, where man, the highest in the hierarchy of formed matter, came in blissful contact with Pure Form or Absolute Actuality.”¹⁷ With such a conception of reality they could see time as unmoved present which always draws the future into itself. Galileo’s conception of time abstracted from man and his purpose, leaving “nothing but a measurable continuum, [where] the present moment alone exists, and that moment itself is no temporal quantity but merely a dividing line between the infinite stretch of a vanished past and the equally infinite expanse of the untrodden future.”¹⁸ Because for Galileo everything is becoming and nothing is actual, time is viewed as a movement going from the past into the future while the present is merely the moving limit between the two. Time ceases to be something *livea* and thus becomes an unsolved problem for modern philosophy.

Finally, with his conception of the real world as *bodies in motion*, and having rejected scholastic teleology, Galileo had to give a positive account of causality. Here again motion is of pivotal importance. Because Galileo was concerned primarily with accelerated motions rather than simple and uniform motions, and because accelerated motions, according to his terminology, always presuppose some force as their cause, he held that the cause of every motion (except simple and uniform motions) has to be expressed in terms of a force or forces. These presupposed forces, like gravity for example, which have as their main characteristics identity, uniformity, and simplicity, served for Galileo as primary or ultimate causes.¹⁹ A succession of atomic motions (which were regarded as secondary events or causes) in mathematical continuity is what, for Galileo, the world of phenomena

17. Burt, *The Metaphysical Foundations*, p. 94.

18. *Ibid.* p. 95.

19. Galileo, as an honest scientist, does not claim to be able to explain the nature of primary or ultimate forces.

consists of. This conception of the world is closely tied up with the conception of causality which under these new circumstances can only be rooted in the motions of the atoms themselves. Consequently, whatever occurs in the world must be seen solely as an effect of mathematical changes in the atoms.

The consequences of this conception of causality are enormous. First of all, it changes the question behind causality from *why* to *how*. That is, stating the cause of events is no longer an answer to a *why* question but to a *how* question. In such a scheme there is no room for final causality because a *why* question can only be answered in terms of purpose or end. Secondly, the new conception of causality along with the absence of the principles of potentiality and actuality now force us to conceive of God's role in the universe in a way radically different from the way the Aristotelians in the Middle Ages have conceived it. He can no longer be thought of as the Supreme Good which the higher (inmattered) forms have as their end, and therefore he is no longer the Final Cause of the universe. The only way he can still play a significant role is if we conceive of him exclusively as the First Efficient Cause or Creator of the atoms. He thus becomes the chief mechanical engineer and inventor needed for supplying the atoms. Such a God may still be worthy of worship but we must admit that worshipping the Supreme Good is not the same as worshipping the Creator of the atoms.

With the natural world thus conceived as a self-contained mathematical machine man could no longer understand himself and his relation to his natural surroundings in the way he once did. In the Middle Ages he thought of nature as teleologically subservient to him and his eternal destiny²⁰; a view consistent with

20. It is very important that we do not assume that the ancient doctrine of finality consisted exclusively of this conviction. It was born, as we will see later, out of philosophical observations and reflections, and only later did Christian theologians later make use of it. It is very doubtful that Aristotle conceived of some kind of eternal destiny of man, and yet he is the father of teleology.

Greek philosophy (like Plato's for example) and both Jewish and Christian theology. The mediæval physicist who operated with this view in mind saw the world as completely intelligible to the human mind. The categories that he used to interpret the world were significantly different from those of the modern physicist: they were essence, substance, accident, matter and form, potentiality and actuality, causality, quality, quantity, relation; not space, mass, energy, or force. In acquiring knowledge man was thought to be active, nature passive. St. Thomas Aquinas, for example, "followed Aristotle in positing an active intellect which abstracted the intelligible from the *datum* of sense, and this active intellect was a power belonging to man."²¹ A teleological explanation of things in the world was seen as being of equal or greater importance than explaining them in terms of efficient causality²². For example, in the Middle Ages it was not uncommon for people to hold that rain fell because it nourished man's crops and because it was ejected from the clouds. The conviction that a single human being is more important than the entire visible universe is a direct result of the theological philosophy of the Middle Ages. Aristotle's Unmoved Mover, says Burtt, had become reconciled with God the Father.

There was an eternal Reason and Love, at once Creator and End of the whole cosmic scheme, with whom man as a reasoning and loving being was essentially akin. In the religious experience was that kinship revealed, and the religious experience to the mediæval philosopher was the crowning scientific fact. Reason had become married to mystic inwardness and entrancement; the crowning moment of the one, that transitory but inexpressibly ravishing vision of God, was likewise the moment in which the whole realm of man's knowledge gained final significance. The world of nature existed that it might be known and enjoyed by man. Man in turn existed that he might "know God and enjoy him forever."²³

Burtt goes on to compare this with the modern view where a human person is

21. M. C. D'Arcy, "*The Philosophy of St. Augustine*". *St. Augustine*. Meridian Books, Inc. New York, 1957. p. 180.

22. In fact, as we will see later, explaining things in terms of efficient causality without regard for final causality can hardly be called an explanation.

23. Burtt, pp. 19-20.

merely a chance and temporary product of a blind and purposeless nature. There is no elevated place for man in the universe; and his ideals and aspirations are but an unfortunate result of his groundless and mistaken imagination. His planet is only a speck in a vast and dark universe which will one day come to ruin. Bertrand Russell expresses this view in the following sentence:

That man is the product of causes which had no prevision of the end they were achieving; that his origin, his growth, his hopes and fears, his loves and his beliefs, are but the outcome of accidental collocations of atoms; that no fire, no heroism, no intensity of thought and feeling, can preserve an individual life beyond the grave; that all the labours of the ages, all the devotion, all the inspiration, all the noonday brightness of human genius, are destined to extinction in the vast death of the solar system, and that the whole temple of Man's achievements must inevitably be buried beneath the debris of a universe in ruins - all these things, if not quite beyond dispute, are yet so nearly certain, that no philosophy which rejects them can hope to stand.²⁴

It is certainly true that a seventeenth-century philosopher would not talk in the way Russell does²⁵, but Burt thinks that this extreme position is already slowly beginning to assert itself at the dawn of the modern, that is, postmediæval, period. Burt's suggestion is perhaps difficult to defend, some would say it is impossible to defend, but it may be worth asking whether Descartes' suggestion, for example (see p. 62 below), that we are not obliged to believe that man is the end of creation, leaves open the possibility that man has no significant place in the universe. Descartes most likely did not imply anything of the sort, but Burt's suggestion is not groundless.

Furthermore, as the statement below from Robert Hooke points out, there were philosophers of nature who sharply distinguished their kind of inquiry from theological matters; from both natural theology or metaphysics, and revealed theology. Experiment became the paradigm by which all conclusions about nature should be reached. Thus, for example, the *Royal Society of London* was founded, according

24. Bertrand Russell, *A Free Man's Worship (Mysticism and Logic)* New York, 1918, p. 46, ff.

25. In fairness to Russell it should be said that he adopted a less extreme position some time after he had written *A Free Man's Worship*.

to its charter, for the purpose of "improving Natural Knowledge by experiment."

The business and design of the *Royal Society* is:

To improve the knowledge of natural things, and all useful Arts, Manufactures, Mechanick practices, Engines and Inventions by Experiments (not meddling with Divinity, Metaphysics, Moralls, Politicks, Grammar, Rhetoric, and Logick). To examine all systems, theories, principles, hypothesis, elements, histories, and experiments of things naturall, mathematicall and mechanicall, invented, recorded or practiced by any considerable authors ancient or modern. In order to the compiling of a complete system of solid philosophy for explicating all phenomena produced by nature or art, and recording a rational account of the causes of things. In the meantime this Society will not own any hypothesis, system or doctrine of the principles of natural philosophy, proposed or mentioned by any philosopher ancient or modern, nor the explication of any phenomena whose recourse must be had to original causes (as not being explicable by heat, cold, weight, figure and the like as effects produced thereby): nor dogmatically define nor fix axioms of scientificall things, but will question and canvass all opinions, adopting nor adhering to none, till by mature debate and clear arguments, chiefly such as are deduced from legitimate experiments, the truth of such experiments be demonstrated invincibly.²⁶

Thomas Sprat, however, points out in his *The History of the Royal Society of London*, that the work of the new scientists through experiment is not only compatible with the Christian religion, but that it also contributes to the revelation of the beauty and order of God's works, and that it therefore gives us all the more reason to revere God. Thus it appears that we have at least two strands of the interpretation of the work of the *Royal Society*. On the one hand, we have someone like Robert Hooke who gives us the impression that the new scientists separated their inquiry from religious concerns, and on the other we have Sprat's attempt to reconcile the scientific enterprise with the religious one.

From Hooke's statement we can also sense an unfavourable outlook on the part of some of the new scientists toward the Greek and mediæval philosophers. A new fever of "protest" against everything traditional gripped some modern philosophers. Goethe notes that this was true "not least and especially in all branches of science." He goes on to add, "who can listen impassively when Bacon compares the works of Aristotle and Plato to lightweight planks that are easily washed

26. Reprinted from Sir Henry Lyons' *The Royal Society 1660-1940 A History of its Administration under its Charters*, Greenwood Press, New York, 1968, p. 41.

up on our shores by the streams of time, precisely because they lack robust and meaningful substance.”” This feeling of superiority over antiquity is well expressed in the famous “Ballad of Gresham Colledge.” Here are a few of its stanzas:

III

Seaven was the number of the Sages;
The eight wiseman wee call a Foole.
Our Fame must then exceed all Ages
Who have Seaventie wise men in one Schoole.
Wee adore thee, Gresham, for the Colledge
From whence must issue soe much Knowledge

V

Thy Colledge, Gresham, shall hereafter
Be the whole world's Universitie.
Oxford and Cambridge are our laughter:
Their learning is but Pedantry.
These new Collegiates doe assure us
Aristotle's an Asse to Epicurus.

VI

By demonstrative Philosophy
They plainly prove all things are bodies.
And those that talk of Quality
They count them all to be meer Noddies.
Nature in all her works they trace
And make her as plain as nose in face.

XXVII

Of all the Arts Mechanicall
Printed shalbe a perfe[ct] Scheme.
And every Science Liberall
Shall be likewise a Colledge Theame.
When the King hath made them a Societie
They'll demonstrate all things but a Dietie.²⁸

27. Goethe, *Farbenlehre*, 572-76, from Josef Pieper's *Living the Truth*, Ignatius Press, San Francisco, 1989, p. 15.

28. Reprinted from Dorothy Stimson's *Scientists and Amateurs: A History of the Royal Society*, Henry Schuman Inc., New York, 1948, pp. 57-58 and p. 63. There may be some scholars who regard this ballad as satirical. Whether or not this leads them to think that its author(s) intended to say the opposite of what their words are conveying I do not know. Dorothy Stimson, however, says on p. 57 that “the author of the verses was familiar with the purposes of the Society and with their experiments, for he gives a fairly accurate account of some of their early interests and achievements.”

Keeping in mind that this was not the attitude of all early modern philosophers of nature, an interesting question may well be raised: What gave rise to this new climate of anti-tradition in scientific circles? An adequate answer to this question would require at least a life-time of research and study. So, I will limit myself to the topic of final causality, that is, to its absence in the scientific inquiry of some of the more important seventeenth-century philosophers of nature. I will consider the views of Francis Bacon, and Rene Descartes.²⁹ Bacon and Descartes are in agreement that final causes should not be considered in Physics, but they differ with respect to the question of reality of final causes. Descartes maintained that in philosophy we should inquire only into efficient causes and not pretend that we can know God's purposes, which is what those who investigate final causes do pretend. "We shall not stop to consider the ends which God has set before Himself in the creation of the world and we shall entirely set aside from our philosophy the search for final causes."³⁰ Does this mean that he allowed for the reality of final causes at least in God's mind? This, as we will see later, cannot easily be answered, but I will nevertheless make an attempt. Bacon, who said that "inquiry into final causes is sterile, and like a virgin consecrated to God, produces nothing,"³¹ and should therefore be removed from physics, nevertheless acknowledged their reality.

My treatment of final causality in modern thought would be incomplete if I did not make reference to seventeenth-century philosophers who disagreed with

29. Baruch Spinoza is another seventeenth century philosopher who rejects the notion of final causality, but his rejection does not stem so much from his dissatisfaction with Aristotelian physics as it does from his own conception of substance, God, and Nature. For that reason his treatment of final causes is not important for the purposes of this project.

30. Rene Descartes, *Principles of Philosophy*, I, 28, trans. by E. S. Haldane and G. R. T. Ross in *The Philosophical Works of Descartes Vol. I*, Cambridge University Press, 1970. p. 230, n.2.

31. Francis Bacon, *Advancement of Learning*, III, 5, P. F. Collier and Son, New York, 1901. p. 168.

Bacon and Descartes and thought it necessary to include final causes in their scientific inquiries. One of the strong supporters of this position is Robert Boyle, a philosopher who is perhaps better known for his contributions to chemistry than physics. His view of final causality is of interest to me because while he disagrees with Descartes, his view of finality seems to be different from Aristotle's doctrine of finality.

The central question, then, of my project is this: **What are the reasons why Francis Bacon and Rene Descartes think it necessary to exclude the consideration of final causes from their physics?** Some of the early modern philosophers were opposed to any kind of teleological explanation of nature, while others insisted that room could be made for final causes in a completely mechanistic conception of nature. They all, however, seemed to have conceived of final causes differently from Aristotle. This gives rise to other closely related questions that are equally important to this project. They are: **Do our three modern philosophers show a sound understanding of Aristotle's doctrine of finality? If not, can their reasons for dropping it out of their scientific inquiries be taken seriously?** A negative answer to both of these questions means that we must reconsider our position on Aristotelian physics, at least with respect to finality, and take another serious look at the doctrine. If nothing else, my hope is that we will not disregard Aristotelian teleology simply on the grounds that some modern philosophers scoffed at it.

My project's claim to originality consists of asking the second of the central questions above. In my reading of the secondary sources on this topic I did not encounter a single scholar who raised this question. Some scholars say that this rejection is tied up with the rejection of substantial forms³², but, as we will see

later, in none of the texts where Descartes discusses final causes do we find him discussing substantial forms. This warrants a doubt that he understood the connection between final and formal causes in Aristotle. I want to point out that my question is a result of inquiring first into the reasons given by Bacon and Descartes for banishing final causes from their physics. My project does not, therefore, consist of merely asking and answering this question. The context in which it arises must first be laid out. A few words need to be said, by way of explanation, about the plan of my project.

The Plan of This Project

Given that we must first inquire into the reasons given by Bacon and Descartes for leaving final causes out of physics, it will first be necessary to lay out Aristotle's and Aquinas' accounts of final causality. Aristotle can properly be called "the father of final causality,"³² and Aquinas is certainly his most important mediæval representative.³⁴ By acquainting ourselves with these accounts we will be able to understand better what it is that the modern philosophers are leaving out of their physics, as well as to compare their understanding of final causality to the more ancient understanding. We will then be in the position to consider Bacon's and Descartes' reasons for omitting, and Boyle's reasons for including final causes in physics.

A close look at these reasons will make it necessary to ask whether our three modern philosophers show a sound understanding of Aristotelian doctrine of final-

32. For the definition of substantial *forms* see chapter IV, pp. 82-83.

33. It is true that philosophers before him possessed the notion of final causality, but it never played an integral part in their philosophies of nature.

34. The Influence of Avicenna or Averroes, for example, has not been as enduring as that of Aquinas, at least in Western thought.

ity. Asking and answering that question will constitute my criticism of the modern position on final causality.

CHAPTER II

ARISTOTLE AND AQUINAS ON FINAL CAUSALITY

It is not foolhardy to believe that the eye is made for seeing.

LUCIEN CUENOT, of the Academy of Sciences

Aristotle's Account of Final Causality

The expression "final cause" is not actually found anywhere in the vast Aristotelian corpus. Aristotle refers to the fourth cause "simply as "the end (*telos*), the "in view of which" (*to ou eneka*), the "why" (*dia ti*)."³⁵ The term "teleology" would be even more foreign to him. It is a modern term coined most likely by Christian Wolff to denote the study of final causes in nature.³⁶ Philosophers who use the term in reference to nature assume that a purposive activity is present in nature and then seek to identify and describe that activity.

Aristotle's treatment of nature is found in the eight books of his treatise entitled *Physics*. In order to understand what Aristotle means by teleology of nature we must first understand how he is using the term "nature". Anyone reading *Metaphysics*, Book V, 4, 1014b16-1015a19 will notice that Aristotle recognizes several different meanings for the term. But in the texts relevant for our discussion of final causality he seems to speak of natures as things belonging to the sensible universe.

35. Etienne Gilson, *From Aristotle to Darwin and Back Again*, trans. by John Lyon, University of Notre Dame Press, 1984, p. 2. In spite of this fact most translators use the expression "final cause." I wish only to point out the fact and not to alter the translated texts that I quote accordingly because through the centuries we have become comfortable with the expression "final cause."

36. "... still another part of natural philosophy, which sets forth the purposes (*fines*) of things. So far it is without name, though it is most noble and most useful. It could be called 'Teleology.'" Christian Wolff, *Logica*, Discursus Praeliminaris no. 85. The quotation translated by Joseph Owens in his "Teleology of Nature in Aristotle," *The Monist* 52 (1968) p. 159.

The etymology of the Greek word for nature (*physis*) allows the signification of either being or becoming. . . . In accordance with the meaning "to grow", which the verb *phyomai* had taken on in regular Greek usage, Aristotle regards the notion of "becoming" or "birth" as primary in the terms *physis*, and its extension outside the world of becoming as merely secondary. In this way "nature" as a technical term became restricted to the visible and tangible universe, and "natural" science or philosophy was limited to the investigation of the sensible world.³⁷

The things of the sensible universe, such as, for example, animals, plants, earth, air, fire, and water, Aristotle called "naturally constituted things" or "things formed by nature."³⁸ He regarded these things as having within themselves the principle of motion (change) and rest as "a sort of life."³⁹ "Nature," as used by Aristotle in this context, must be understood as that which adequately designates the intrinsic principles, in the substantial order⁴⁰, of motion and rest. He himself defines it as "a principle and a cause of being moved or of rest in the thing to which it belongs primarily and in virtue of that thing, but not accidentally."⁴¹ Therefore everything that has nature or is by nature belongs to the category of substance.

A mobile thing, according to Aristotle's analysis of motion, has two components: form and matter. The form of a thing is that about it which is intelligible or knowable. It is the thing's actuality⁴². Matter by itself is not something knowable,

37. Joseph Owens, *A History of Ancient Western Philosophy*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1959. p. 309.

38. *Ph.* II 2, 192b10-15. See also *Ph.*, VII 1,250b14. R. P. Hardie and R. K. Gaye's translation in *The Basic Works of Aristotle*, ed. by Richard McKeon, Random House, New York, 1941.

39. *Ph.*, Book VII, 1,250b14; *Aristotle's Physics*, trans. by Hippocrates G. Apostle, The Peripatetic Press, Grinnell, Iowa, 1969. All quotations of Aristotle's texts are from Apostle's translation unless otherwise noted.

40. I say "in the substantial order" because when Aristotle speaks of animals, plants, etc., that is, natural things, he regards them as substances. Substance, in this sense of the word, is understood by Aristotle as the *subject of change*. In *Metaph.*, V 8, 1017b10-14 he defines "substance" as "the simple bodies, such as earth and fire and water and all such, and in general the bodies and whatever consists of these, such as animals and divine things, and also the parts of these. All these are called "substances" in view of the fact that they are not predicated of a subject, but the others are predicated of these."

41. *Ph.* II 1, 192b21-23.

42. By *actuality* (Greek: *energeia*) Aristotle means "that mode of being in which a thing can bring other things about or be brought about by them--the realm of events and facts. By contrast, **potential-**

but can only be known in relation to form. As the absolutely primary and formless substrate, it is a potential principle capable of shedding one form and taking on another, a process which makes change possible. For Aristotle both matter and form are each "nature", and when he uses expressions like "things constituted by nature" or "things formed by nature" he is referring to composites (for example, the human person) arising out of the two.

To sum up, "nature" is in this sense restricted by Aristotle to the sensible realm, but it is at the same time made to indicate principles that are at bottom firmly fixed, incorruptible, and intrinsic to everything in the changing cosmos.

Because Aristotle's discussion of final causality is embedded in his discussion of the four causes, it is wise, I think, to begin looking at final causality in that context rather than treat it separately. We have just seen in our discussion of "nature" that matter and form are intrinsic principles of a sensible substance. As such, they are two of its intrinsic causes, and in the Peripatetic tradition they are known as the *material* and the *formal* causes. Extrinsic causes, on the other hand, are those which are the principal origin of movement or coming to rest, and that for the sake of which something is done. They go under the names *efficient* and *final* causes.⁴³ The main text where Aristotle treats the topic of four causes is *Physics* II 3, 194b 24-195a 4. He describes each of the causes in this way:

In one sense, "a cause" means (1) that from which, as a constituent, something is generated; for example, the bronze is a cause of the statue. . . . In another, it means (2) the form of the pattern, this being the formula of the essence, and also the genera

ty (Greek: *dynamis*) is not a mode in which a thing exists, but rather the power to effect change, the capacity of a thing to make transitions into the different states. *A Dictionary of Philosophy*, ed. by Antony Flew, Pan Books Ltd., London, 1979.

43. To label final causes as extrinsic is not quite correct, that is, it is incomplete. The externality of the final cause can be seen in the following example: health is the cause of taking a walk. It is clear that in this case health is that for the sake of which something, namely walking, is done, and that health is something external to walking. But, as we will see later, Aristotle also identifies the formal cause with the final cause. When the form of a thing is potentially its end, the final cause is regarded as intrinsic because the form is intrinsic.

of this: for example, in the case of the octave, the ratio 2:1, and, in general, a number and the parts in the formula. In another, it means (3) that from which change or coming to rest first begins; for example, the adviser is the cause, and the father is the cause of the baby, and, in general, that which acts is a cause of that which is acted upon, and that which brings about a change is a cause of that which is being changed. Finally, it means (4) the end, and this is the final cause [that for the sake of which]; for example, walking is for the sake of health. Why does he walk? We answer, "In order to be healthy"; and having spoken thus, we think we have given the cause. And those which, after that which started the motion lie between the beginning and the end, such as reducing weight or purging or drugs or instruments in the case of health, all of them are for the sake of the end; and they differ in this, that some of them are operations while others are instruments.

This description of the four causes, by itself, is not of much help for our purpose of laying out Aristotle's account of final causality. We must make clear the context in which the discussion of causes is embedded. For this we must know the main problem of the *Physics*. Before we turn to it, however, it is important to say something about the character of physics as a science, that is, the character Aristotle thought it should have.

If it is the physicist's task is to study nature, that is, "things constituted by nature", and if by "nature" is meant the composites of matter and form, then the main character of the science of physics is the study of both matter and form. But Aristotle qualifies this claim.

We must not fail to notice how the essence and the formula of an object of physics exists, for inquiry without this leads nowhere. Now of things defined and of the whatness of things, some are considered in the manner in which snubness exists, others in the manner in which concavity exists. These differ by the fact that "snubness" is *understood* with matter (for a snub is concave nose) but "concavity" without sensible matter. If then, all physical things are named in a manner like the snub (as for example a nose, an eye, a face, flesh, bone, and in general an animal, and also a leaf, a root, a bark, and in general a plant; for what is signified by the formula of each of these is not without motion but always has matter), it is clear how we must seek and define the whatness in physical things and why it belongs to the physicist to investigate even some part of the soul, namely, that which does not exist without matter.⁴⁴

The physicists, then, should study both matter and form, but only those forms that are embodied in matter and are separable only in thought. The forms that are really separable, pure forms, are the objects of metaphysics. They are God, intelli-

44. *Metaph.* VI 1, 1025b 29-1026a 7.

gences that move the spheres, the rational element of the human psyche. Physics has nothing to do with these things. But it is also separate from the science which is solely concerned with matter: a science that looks at a living body, or a non-living compound, in terms of its elements without paying attention to the structure which makes the thing what it is. "Aristotle is in fact pronouncing in favour of teleology as against *mere* mechanism, in favour of studying the parts in the light of the whole instead of treating the whole as merely a sum of parts."⁴⁵ The object of physics, then, is to study "informed matter or immattered form."⁴⁶

We can now turn to the main problem of the *Physics*, and that is the problem of stating the causes which are at work in nature. "For we think we know each thing when we know the first causes and the first principles and have reached the elements."⁴⁷ If to know something is to know its causes, the physicist, in order to know nature, must inquire into the kinds of causes of physical change or motion. The enumeration and the description of the causes that Aristotle gives in *Physics* II 3 is his answer to what kinds of causes a physicist should consider. "Since the causes are four, it is the task of the physicist to understand all of them; and as a physicist he should state the *why* by referring it to all of them--the matter, the form, the mover, and the final cause."⁴⁸ For our purposes we are mostly concerned with why Aristotle thinks it necessary that a physicist should inquire into the final causes of nature. Judging from the *Physics* II, 3 one reason why a physicist should inquire into final causes is that they are among the causes, and knowledge of a thing is derived through knowledge of its causes. It would therefore be foolish to

45. W. D. Ross, *Aristotle*, Methuen & Co. Ltd., London, 1963. p. 71.

46. *Ibid.*

47. *Ph.*, I 1, 184a14.. Note that Aristotle is equating first causes with first principles. This, as we will see later, is important to his way of philosophizing. See *An. Post.*, I 2, 71b9-12., *Metaph.*, I 3, 983a25.

48. *Ph.*, II 7, 198a23-24.

omit them.

Two important questions now assert themselves. To what extent are final causes of nature knowable? If they are for the most part mysterious and beyond being fully grasped by the human intellect, should we as physicists disregard them all together? At this point I do not want to dwell on these questions at length, but simply to raise them and suggest that the method of philosophical inquiry, or our idea of what it means to philosophize, may be the determining factor in how we are going to answer them. For that reason we should keep a close watch on Aristotle's method of philosophizing [for he obviously thinks that we should take final causes into account] and note any striking differences, if there be any, between him and, for example, Descartes.

Let us return again to the four causes and say more about them; merely naming and describing them is not enough to understand why as physicists we must refer to them.⁴⁹ By "matter" Aristotle does not mean a particular sort of thing; we cannot point to it and say, "See, there is matter." Matter is a relative term--relative to form: "to each form there corresponds a special matter."⁵⁰ It is the stuff out of which a thing is made as opposed to its structure; it is that which can be structured as opposed to that which structures. This distinction between matter and form can be made by an abstraction of thought both in nature and in art. In nature the distinction can be made in the following way: "the elements, which are the determinate product of prime matter+the primary contraries hot and cold, dry and fluid, are matter relatively to their simple compounds the tissues; these again are matter relatively to the organs, and these are matter relatively to the living body."⁵¹

49. For this further explanation of the causes I am relying on W. D. Ross' *Aristotle*.

50. *Ph.*, II 2, 194b9. Hardie and Gaye translation.

51. W. D. Ross, *Aristotle*, p. 73.

Prime matter is not something that exists on its own or apart from the material things. Secondary matter, on the other hand, does. Thus, for example, we can find tissues separated from the organs, or organs separated from the living bodies.

“Form” is used by Aristotle in at least two senses. Sometimes it means a sensible shape, as for example when we say that a sculptor is giving the clay a new form, and in that case Aristotle uses the word *μορφή*. It also means the intelligible structure and then the word *εἶδος* is used. The latter seems to be central in Aristotle’s notion of form and is used more often than the former. That which is the object of thought, rather than of sense, seems to be what Aristotle has in mind when he speaks of the inner nature of a thing, or of the plan of its structure⁵². Thus when he speaks of the *logos* (formula or definition) and the “what it is to be so and so” he seems to be speaking in the context of *εἶδος*, that is, of intelligible structure.

The formal cause, Aristotle says⁵³, is often one and the same as the efficient and the final cause. As to the relation between formal and final causality, the form of a thing, whether natural or artificial, is the plan of structure which informs that thing. The final cause is also that plan, but prior to the actual embodiment of it in the thing. It is the plan which nature or art aims at. This must be understood in strictly abstract terms, otherwise we are going to think of nature as consciously aiming at embodying the plan. In fact, we must not even think of nature as a force existing by itself.⁵⁴ “Nature is a collective name for the respective natures of all

52. This an important point. Descartes, because he wants to explain the universe in terms of purely material causes, that is, causes independent of thought, can never admit the reality of formal causes in nature, and consequently he has to deny final causes as well.

53. *Ph.*, II 7, 198a25.

54. This may be difficult for the modern mind which is accustomed to thinking about nature as one thick soup with everything in it. It seems that children today are being asked at school to “understand what is meant if you mixed up the dog and the cat and everything else into one monster with myriad legs and called it nature.” G. K. Chesterton, *St. Francis of Assisi*. Doubleday & Company, Inc.,

natural objects. . . . The final cause in nature is a structure common to a whole *in-fima species*, to which individual members of the species strive without conscious purpose to give a fresh individual embodiment."⁵⁵

The identity of the final-formal with the efficient cause is more difficult to see. Every material thing possesses a natural movement toward a particular place in the universe according to which it will move, provided nothing interferes. Being in that place in the universe is part of the thing's form, and this fact functions as the final and the efficient cause. For example, although we say that a man is the efficient cause of a house being built, it is more accurate to say that a man who is a carpenter is the efficient cause. In fact it is more accurate yet to say that the art of carpentry, that is to say, the form of the house as it is known by the carpenter, is the efficient cause.⁵⁶ "Thus one thing, the form, functions both as a component in that which is produced, as its final cause, and as the really efficient element in its efficient cause."⁵⁷

We are now ready to turn to Aristotle's discussion of teleology in nature. The main texts where Aristotle stresses the need for employing the final causality in understanding of nature are found in *Physics* II 8, *On the Parts of Animals* I 1, and *Metaphysics* I 1 and 2. Let us consider the arguments found in each of these sections.

In *Physics* II 8, Aristotle sets out to show "that Nature belongs to the class of causes which act for the sake of something."⁵⁸ He finds himself confronted right

Garden City, N.Y., 1957. p. 88. This is one reason why High School students should read Aristotle as part of their regular curriculum.

55. W. D. Ross, *Aristotle*, p. 74.

56. See *Ph.*, II 3, 195b21-25.

57. W. D. Ross, *Aristotle's Physics*, Oxford University Press, London, 1936. p. 37.

58. *Ph.*, 198b10, Hardie and Gaye translation.

at the start by Empedocles' theory. Empedocles seems to have put forth a kind of "survival of the fittest" hypothesis which he thought could explain the various animal species and the adaptation of their parts to ends. According to this hypothesis nature had generated a very large number of species but only the ones with enough strength survived. Aristotle thinks the theory is plausible enough to be worthy of consideration. It deserves as much consideration as the claim that the reason why rain falls has nothing to do with the growth of wheat. It falls because "what goes up must be cooled, and the resulting cold water must come down, and when this takes place, the growth of corn just happens."⁵⁹ Similarly, we might say that some animals by necessity have their front teeth sharp and their hind teeth broad, but the fact that this is perfectly suited for tearing and chewing food is a matter of chance. Thus we would have to say, along with Empedocles, that it is by *chance* that some species were better fitted for survival.

Aristotle responds by noticing that the adaptations, like that of the teeth for the function they perform, can be found fairly consistently. But whatever occurs by chance does not occur consistently. If it did, we would not say it occurs by chance. The adaptations must therefore be occurring for the sake of an end, and because they are natural, we can conclude that nature acts toward an end.⁶⁰

It may be objected that the argument is not a very strong one because it leans too heavily on the assumption that "all things by nature (like the adaptations of the parts of animals [eg., teeth] for the work they have to do) come to be always or for the most part." Empedocles' claim is that the adaptations occurred only in a rela-

59. *Ph.*, II 8, 198b20-22.

60. "In our way of saying it, perhaps this amounts to saying that certain things of a given definite nature proceed to a given definite end unless prevented, or tend to a given definite end. For example, dense objects tend toward the center of the Earth, water tends to evaporate when heated, an acorn tends to become an oak, and man begets man." Apostle's commentary #13 on Book II of the *Physics*.

tively few cases while the non-adaptations perished because of mechanical necessity. Ross suggests that Aristotle can argue back by asking, "why do not monstrous growths go on being produced as often as normal growths? Why do animals breed true to type?"⁶¹ Aristotle's argument for design or teleology in nature seems to be most strongly supported by the permanence of types. To deny, he says, that from a particular seed a matching plant is produced for the most part consistently, is to deny nature itself. It is to allow for the possibility that from a particular seed anything can come about, and to claim that the production of a matching plant is a matter of chance. But this is contrary to the way things in fact are. An oak was produced in a precise way from a particular seed, and we can say that it was produced by nature. To say that an acorn or an oak has a nature is to say that it can act in a particular way and is not at the mercy of chance.

Now because nature may be either matter or *form*, and the form is the end with everything else being for the sake of the end, "it is *form* that would be a cause in the sense of a final cause."⁶² Here we see Aristotle arguing for the internality of the final cause (see note 43); a point we should keep in mind for the purposes of comparing Aristotle's account of final causality with that of Descartes.

Let us now turn to Aristotle's discussion of final causality in *On the Parts of Animals* I 1.⁶³ Two points must first be made by way of background. First, we must mention a point made by Aristotle in the opening chapter of *History of Animals*. It is of fundamental importance for the discussion of final causality in the context of *On the Parts of Animals*. Aristotle notices that the parts of which animals are composed are of two kinds: simple and composite. Simple parts like

61. W. D. Ross, *Aristotle*, p. 78.

62. *Ph.*, II 8, 199a33.

63. I am relying for this discussion on Gilson's *From Aristotle to Darwin and Back Again*.

bones and flesh can be separated into parts of a uniform nature: bones are made up of chunks of bone, and flesh is made up of pieces of flesh. Composite parts, on the other hand, are not divisible into parts that are uniform among themselves: a finger cannot be divided into fingers. He calls the simple parts homogeneous and the complex parts heterogeneous.

Second, Aristotle points out in *On the Parts of Animals* that it makes a great deal of difference whether we approach the study of living beings by primarily being interested in the process of their formation and only then consider them as wholes or vice versa. He thinks it better to describe the completely formed organism first and then to inquire into the process of formation. The opposite approach had been that of his predecessors.

Now homogeneous and heterogeneous parts each require, for their explication, different kinds of causes. The homogeneous parts can be explained by the efficient cause, often referred to by Aristotle as "the point of origin of motion." Heterogeneous parts, however, need for their explication the "that for the sake of which." Supporting this claim constitutes the discussion of final causality in *On the Parts of Animals* I 1. The following quotation will give us a good start.

But if men and animals and their several parts are natural phenomena, then the natural philosopher must take into consideration not merely the ultimate substances⁶⁴ out of which they are made, but also flesh, bone, blood, and all the other homogeneous parts; not only these, but also the heterogeneous parts, such as face, hand, foot; and must examine how each of these comes to be what it is, and in virtue of what force. For to say what are the ultimate substances out of which an animal is formed . . . is not sufficient. . . . For an [animal] is such and such a form embodied in this or that matter, or such and such a matter with this or that form; so that its shape and structure must be included in our description. For the formal nature is of greater importance than the material nature.⁶⁵

The last sentence is pivotal for understanding why the explanation of heteroge-

64. Had Aristotle written this today he could have substituted for "the ultimate substances" things like atoms, or even electrons, protons, and neutrons.

65. *On the Parts of Animals*, I 1, 640b18-29. trans. by W. Ogle, from *The Basic Works of Aristotle*, ed. by Richard McKeon.

neous parts must take into account final causality. If all the problems presented to a natural philosopher involved only homogeneous parts, it would suffice to take into consideration only matter, for matter is homogeneous. It would then also suffice to account for reality merely in terms of mechanical processes. But it is clear that there are beings of heterogeneous structure, and as such they require a more intricate explanation. Gilson, following Aristotle, says that "to explain heterogeneous parts by the same principles which explain homogeneous parts is to leave deliberately unexplained the heterogeneity of the heterogeneous."⁶⁶ And that is precisely what his predecessors, as well as some modern philosophers, have done.⁶⁷ But if there is in reality a principle of unity, for example, substance, "it is necessary that the four kinds of causes be able to return, in one manner or another, to this principle: a cause of any kind whatsoever *is* such only through it."⁶⁸

Now the reason why there is heterogeneity in the structure of certain beings is that they are living beings. As such they are born, they grow and mature, and they die. They are things that change, and therefore belong to the order of motion, for all change is motion.⁶⁹ Heterogeneous parts of living beings must make up a certain order. But the notion of order cannot be separated from the notion of causality, "which is itself an order of dependence."⁷⁰ For a living being to be able to move itself, in one way or another, it must be composed of organized heterogeneous parts. That is why we call them organisms. Aristotle's doctrine of final

66. E. Gilson, *From Aristotle to Darwin*, p. 5.

67. Contemporary scientists and philosophers who think that mechanistic explanations are new and teleological ones ancient are deceiving themselves. It would be to their benefit to read history of ancient western philosophy.

68. E. Gilson, *From Aristotle to Darwin*, p. 3. See also *On the Parts of Animals*, 11.

69. Here we must keep in mind that Aristotle's analysis of motion involves the consideration of both matter and form, and that for him the form and the *end* are often identical (though this does not mean that one of them drops off leaving us with only three causes).

70. *Ibid.*

causality is his attempt to explain this organization. There really is no other way of explaining it. Aristotle says that those who do not take into account both types of causes "tell us in reality nothing about nature. For primary cause constitutes the nature of an animal much more than does its matter."⁷¹ Not only will material cause not tell us much about the nature of an animal, but it does not come first. "Now we must decide which of these two causes comes first, which second. Plainly, however, that cause is the first which we call the final one. For this is the Reason, and the Reason forms the starting-point, alike in the works of art and in the works of nature."⁷² But, we may ask, why should we concern ourselves with primary or first causes so much? Why should we not be content with conducting our study of nature merely in terms of material and efficient causes? The answer takes us into Aristotle's *Metaphysics*, and it will tell us something about the nature of the philosophical act as it is understood by him.

When Aristotle says at the very beginning of *Metaphysics* that "all men by nature desire to *know*," he has in mind a particular kind of knowledge, a knowledge that is the basis of art. "Art arises when from many notions obtained by experience one universal conception regarding a class of things has come about."⁷³ The emphasis here is on the *universal* character of this kind of knowledge. To say that someone has *universal* knowledge is to say that their knowledge holds good "for every possible instance of things marked off according to one εἶδος,—'form.'"⁷⁴ Universal knowledge, then, is the knowledge of the *form*. It is the kind of knowl-

71. *On the Parts of Animals*, I 1, 642a17-18.

72. *Ibid.* 639b14-16. Even though Ogle uses the phrase "final cause", the abstract phrase does not appear in the Greek text.

73. *Metaph.*, I, 980a5-7. Trans. by Joseph Owens in his *The Doctrine of Being in Aristotelian "Metaphysics"*, p. 158.

74. *Ibid.*

edge that goes beyond experience which yields only facts: it is the Wisdom of the wise because it yields the *cause* of a thing. But are not the material and efficient causes also causes of things? They are, but by knowing them a philosopher knows only the particular, not the universal.

So, the higher and more general the cause known, the wiser the knower. With what kind of cause, then, is Wisdom primarily concerned?

Of the attributes listed, that of *knowing* all things must belong to him who has universal *knowledge* in the highest degree: for he understands in a sense all the underlying subjects. And the most universal things are on the whole the hardest for men to know, for they are most removed from sensations. Also, the most accurate of the sciences are those which are concerned mostly with the first causes, for the sciences with fewer principles are more accurate than those which use additional principles: for example, arithmetic is more accurate than geometry. Moreover, the science which investigates causes is more capable of teaching than the one which does not; for those who teach are those who state the causes of each thing. Further, to understand things or *know* for their own sake belongs in the highest degree to the sciences of that which is *known* in the highest degree: for he who pursues *knowing* for its own sake will pursue most of all the science taken in the highest degree, and such is the science which is *knowable* in the highest degree; and that which is knowable in the highest degree is that which is first or the causes, for it is because of these and from these that the other things are known, and not these because of the underlying subjects. Finally, the supreme science, and superior to any subordinate science, is the one which knows that for the sake of which thing must be done, and this is the good in each case, and, in general, the highest good in the whole of nature.

From all that has been said, then, it is evident that the name which is sought applies to the same science: for it is this science which must investigate the first principles and causes, and the good or final cause is one of the causes.⁷⁵

It is therefore the final causes or the good that is the object of wisdom. But Aristotle says the universal knowledge is the knowledge of the form? Which is it then, the formal or the final cause that is the most important? It is the final cause as the form. I said above⁷⁶ that Aristotle sees the formal cause as often being identical with the final cause. The formal cause is the plan of structure which informs the thing, and the final cause is also that plan, but it is that plan as being intended or aimed at, so to speak, by nature. The notion of end means for Aristotle the limit, that is, the completion of growth of all living things. It is the actuality of

75. *Metaph.*, I 2, 982a19-982b10.

76. See pp. 23-24.

their potential. It is the good toward which they strive.

Since their development always leads to a limit which is at least provisionally felicitous, and since the reason for this success is not met with in any of their parts as parts, it is necessary that this future limit preside from the beginning over the ordering of the parts. This is what Aristotle calls the *telos*, *to ou eneka*, *to dia ti*, *o skopos*, or further, the cause of the felicitous conclusion of the operation: *aitia tou eu*, that which causes the growth to take place beautifully and properly and results in a state so characterized: *to aition tou kalos kai orthos*. It does not spring from the physical order, which is that of nature (*physis*). Perhaps it would be necessary to go beyond this order if one wished to rise to the cause of the physical cause, but this is the metaphysician's task, not the naturalist's, who in his own fashion is only a physicist. For the latter the orientation of all growth toward its end is the highest property of what he calls the "form" of the living being. This celebrated "substantial form," the nonexistence of which Descartes took upon himself to announce to the world, justifies itself in Aristotle's eyes by the sole fact that unless one assigns it as a cause, the growth of the living beings becomes inexplicable from the point of view of being oriented to a limit.⁷⁷

The wisdom of the natural philosopher lies in his grasping of the "substantial form" of a thing he or she is studying. Gilson here gives us a hint helpful toward understanding why Descartes dropped final causality out of his consideration of the material universe. He eliminated the doctrine of "substantial forms" without which it is difficult to imagine how the final cause could be an intrinsic cause of a natural thing. We will return to this point when we evaluate Descartes' reasons for dropping final causality. Now let us turn to St. Thomas Aquinas.

Aquinas' Account of Final Causality

In attempting to get a grasp of what Aquinas has to say about final causality we must agree with Gilson when he says that "the field of natural philosophy is the one where St. Thomas has made fewest innovations; that is, at least, if we restrict it to physics and biology, properly so called. Here the Christian doctor adds nothing to Aristotle, or so little that it is hardly worth mentioning."⁷⁸ Why then, it

77. E. Gilson, *From Aristotle to Darwin*, p. 15.

78. Etienne Gilson, *The Christian Philosophy of St. Thomas Aquinas*, trans. by L. K. Shook, C.S.B., Random House, New York, 1956, p. 174. Gilson's view has not gone unopposed. Helen S. Lang argues in her "Aristotelian Physics: Teleological Procedure in Aristotle, Thomas, and Buridan," *The Review of Metaphysics* (March 1989, Vol. XLII, No.3., Issue No. 167) that Thomas' physics is not one of his least original areas of thought. Her argument, however, does not contribute significantly to the context in which we must see Thomas' account of final causality. We can rely on Gilson for laying out

may asked, are we even considering Aquinas's account of final causality? The answer is simple: the philosophy of St. Thomas is a Christian philosophy, and as such it treats the topic of causality (including finality) in ways that are peculiar to it. Here again Gilson is helpful.

Where St. Thomas is at home and able to perform with ease the task that comes more natural to him is in the metaphysical investigation of the principles of natural philosophy. Here once again the Christian philosopher proves his originality. Here it is a question of the relation that binds the efficacy of second causes to God. Here he feels himself directly interested in its exact determination.⁷⁹

St. Thomas' account of final causality must therefore be seen in the context of his Christian metaphysics. Before we take a look at that account it would be helpful to say something about Aquinas' general conception of causality.

In the last quotation from Gilson's book we find a clue that can help us in outlining that conception. The clue has two parts. First, if for Aquinas causality in nature is embedded in metaphysics, and metaphysics is the study of being, the discussion of causality is going to revolve around being. Secondly, the discussion is going to be about "the relation that binds being and the efficacy of second causes to God." It appears, then, we will also have to understand God's role in causality.

Why must the discussion of causality revolve around being? M. C. D'Arcy makes a helpful remark.

Once grant that knowledge is of being and that that being is an intelligible and real object of the mind with its laws and stratification, then St. Thomas is right in co-ordinating in a metaphysical system the data of experience and looking for the ultimate explanation of terms such as truth, goodness, evil, end and causality at the level of metaphysics. This is conspicuously the case with causality.⁸⁰

Aquinas, following Aristotle, regards cause as a condition of being, and agrees that to know a thing is to know its causes⁸¹. So, to affirm that a thing is intelligible

that context in spite of Lang's criticism.

79. Gilson, *The Christian Philosophy of St. Thomas Aquinas*, p. 175.

80. M. C. D'Arcy, *Thomas Aquinas*, The Newman Bookshop, Westminster, Maryland, 1944, p. 143.

81. Or, as Robert P. Goodwin puts it in his introduction to St. Thomas' *Principles of Nature*, to know a thing is "to know it in its causes." Macmillan Publishing Company, New York, 1965, p. 3.

it is necessary to posit the four causes which are "not primarily the data of sensible experience, but objective conditions of knowledge."⁸² A philosopher whose task it is to make sense out of reality is going to maintain that reality must be intelligible. That is why he seeks to discover the nature of each object [thing] and the reasons why it behaves in the way that it does. He also wants to know what or who is responsible for bringing it into existence, and the purpose for which it has been given its existence and behaviour. The philosopher gets the answer to these questions by inquiring into the formal, efficient and final causes. "Consequently St. Thomas holds that causality belongs to the very fabric of reality, and is a necessary conception for any philosophy, and is, moreover, presupposed in every form of scientific study."⁸³ The reason, then, why causality is tied up with being is that without causality being would be unintelligible to the philosopher for whom being or reality is the object of inquiry.

In the philosophy of St. Thomas being is understood in a way that is significantly different from the ways in which it was understood by his predecessors. In order to understand God's role in causality, the second and main part of our clue, it is absolutely necessary to say something about being⁸⁴ as it is understood by the

82. M. C. D'Arey, *Thomas Aquinas*, p. 143.

83. *Ibid.* p. 64.

84. In St. Thomas' early work *De Ente et Essentia* among the most important terms are *ens*, and *esse*. These Latin words are derived from *sum*, which means 'I am.' Armand Maurer, a translator of this work, gives in his introduction a helpful explanation of the terms. "*Esse* is the infinitive of the verb *sum*, and it means simply 'to be'. *Ens* is the participial form, corresponding to the English 'being'. St. Thomas uses both as verbal nouns, and he explains their relationship as follows. *Ens* is a concrete term, like *currens*. *Currens* signifies concretely 'one who is running' or 'a runner'; *ens* signifies concretely 'that which is'. As *currens* signifies a person along with his act of running, so *ens* signifies a subject as possessing an act of being or existing. This act of being, exercised by the subject, is expressed by the infinitive *esse*, as *currere* expresses the act of running. Both are abstract terms for they abstract from the subject of the quality. *Ens* resembles the concrete noun *album*, which means 'a white thing', expressing the subject as qualified by the colour white. *Esse*, on the other hand, denotes only the act of being, in abstraction from the subject of the act. . . This Latin metaphysical language has no adequate English equivalent. But perhaps we shall not betray the thought of St. Thomas, while observing the rules of good English, if we render *ens* as 'a being' and *esse* as 'being'." *On Being and*

Angelic Doctor.

Given that there are two Latin words, *ens* and *esse*, for one English word 'being', we should seek out the two meanings of being. The meaning of *ens* (a being) is stated by St. Thomas in his *De Ente et Essentia* chapter one, § 2.

We must realize (with the Philosopher [Aristotle]) that the term 'a being' in itself has two meanings. Taken one way it is divided by the ten categories; taken in the other way it signifies the truth of propositions. The difference between the two is that in the second sense anything can be called a being if an affirmative proposition can be formed about it, even though it is nothing positive in reality. In this way privations and negations are called beings, for we say that affirmation is opposed to negation, and that blindness is in the eye. But in the first way nothing can be called a being unless it is something positive in reality. In the first sense, then, blindness and the like are not beings.

A being that is something positive in reality is referred to by St. Thomas as a substance by which he means "a thing to which it belongs to be not in a subject" or "that which has a quiddity to which it belongs to be not in another."⁸⁵ We can conclude then that *ens* or 'a being' is a substance⁸⁶.

By defining being as substance St. Thomas has merely repeated Aristotle's own conception of being. When, however, he turns to *esse* he comes into his own. For Aristotle, to be a substance is one and the same with 'to be' because substances exist in their own right, and so for him there is no philosophical problem con-

Essence, The Pontifical Institute of Medieval Studies, Toronto, 1983, p. 14. (I am using Maurer's translation for all my quotations from this work.) Gilson in his *The Christian Philosophy of St. Thomas Aquinas* suggests that it is preferable to translate *esse* by "act-of-being" (p. 29), and G. Smith by *is-ing*.

85. St. Thomas Aquinas, *Summa Contra Gentiles*, I, 25, § 10, trans. by Anton C. Pegis, Image Books A Division of Doubleday & Company, Inc., Garden City, New York, 1955, p. 129.

86. St. Thomas, following Aristotle, understands substance in a twofold way. In *Sum. Theol.*, I, 29, 2 *Resp.*: "According to the Philosopher, substance is twofold. In one sense, it means the *quiddity of a thing*, signified by the definition, and thus we say that the definition signifies the substance of a thing; in which sense substance is called by the Greek *ousia*, which we may call *essence*. In another sense, substance means a *subject* or *suppositum*, which subsists in the genus of substance." An even more helpful explanation of substance is found in St. Thomas' *De Pot.*, IX,1: "... substance may be taken in two ways. In one sense it is the ultimate subject which is not predicated of another; and this is the individual in the genus of substance; while in another sense it is the form or nature of a subject. The reason for this distinction is that several subjects may have a common nature; thus several men have in common the nature of man. Hence the need of distinguishing that which is one from that which is multiple; for the common nature is signified by the definition which indicates what a thing is; so that this com-

nected with the existing of things. Substance as Aristotle has conceived it is never in potency to non-being, that is, it cannot not exist. But for Aquinas the created world of substances does not exist in its own right and therefore the question of its origin and end arises. As a world that might never have existed it is contingent in its very existence. St. Thomas offers an example to show what he means by saying that the world is contingent in its very existence.

To apply to this: every creature stands in relation to God as the air to the light of the sun. For as the sun is light-giving by its very nature, while the air comes to be lighted through sharing in the sun's nature, so also God alone is being by his essence, which is his *esse* [act-of-existing], while every creature is being participatively, i.e. its essence is not its *esse* [act-of-existing]. This is why Augustine writes, *Were God's power at any moment to leave the beings he created to be ruled by it, their species would at once cease to be and their whole nature would collapse; and further, Just as the air is made bright as long as light is present, so man is in the light as long as God is present to him, and when God is not present, he abides in darkness.*⁸⁷

The proper question, then, for a metaphysician is the question of existence rather than substance. That is, she or he is more interested in the science of being as *esse* [act-of-existing] than as *ens*. This is so because "the composition of substance and existence is not the same as the composition of matter and form."⁸⁸ A being, or a substance, is that which has a nature (a composite of matter and form), and the study of nature belongs to the physicist.

But we did not yet lay out the second meaning of being, i.e., the meaning of *esse*. What St. Thomas means by *esse* can best be seen if we understand the composite of essence and *esse*. An understanding of this composite will also bring us back to the discussion of causality.

mon nature is called the essence or quiddity. Wherefore whatsoever a thing contains pertaining to the common nature is included in the signification of the essence, whereas this cannot be said of all that is contained in the individual substance. For if whatsoever is in the individual substance were to belong to the common nature, there would be no possible distinction between individual substances of the same nature." St. Thomas Aquinas, *On the Power of God*, trans. by Lawrence Shapcote, The Newman Press, Westminster, Maryland, 1952. vol. III, p. 98.

87. St. Thomas Aquinas, *Summa Theologiae*, Blackfriars in conjunction with Eyre & Spottiswoode, London, and McGraw-Hill Book Company, New York, 1975. I, 104, I.

88. *Summa Contra Gentiles*, II, 54.

Now essence is another word for nature.

Because the definition telling what a thing is signifies that by which a thing is located in its genus or species, philosophers have substituted the term 'quiddity' for the term 'essence'. The Philosopher frequently calls this 'what something was to be'; that is to say, that which makes a thing to be what it is. It is also called 'form', because form signifies the determination of each thing, as Avicenna says. Another term used for this is 'nature', using 'nature' in the first of the four senses enumerated by Boethius. In this sense anything is called a nature which the intellect can grasp in any way; for a thing is intelligible only through its definition and essence. That is why the Philosopher, too, says that every substance is a nature. The term 'nature' in this sense seems to mean the essence of a thing as directed to its specific operation, for no reality lacks its specific operation. The term 'quiddity' is derived from what is signified by the definition, while 'essence' is used because through it, and in it, that which is has being.⁸⁹

St. Thomas is here using the word 'substance' in the sense of essence or nature. When we speak of the composite of essence and *esse* we must not take essence to mean "an essential situation as essential, but the essential situation of *an* existent."⁹⁰ The reason for this is that an essential situation (the kind that a thing is, or its nature) is an essential situation of a particular existent (an existing thing, ex., a human being, a dog) that belongs to a group of other existents in the same essential situation.⁹¹

Now the name that describes the existential status of an existent, regardless of its essential status, is *substance*. "Substance is the name for the subject of the verb predicate 'is' or 'exists', as in, e.g., *a man exists*. Substance, that is, names any 'clunk' of which you can say '*it is*'."⁹² It may seem that using the word substance in this way is not quite in line with its twofold meaning given to it by Aristotle. But it is. We are merely pointing out that, even though a subject or substance is in an essential situation, the name substance does not refer to a subject's essential situation but is the name of an existent that is the proper subject of "is." Substance

89. St. Thomas Aquinas, *On Being and Essence*, pp. 31-32.

90. Gerard Smith and Lottie H. Kendzierski, *The Philosophy of Being*, Marquette University Press, Milwaukee, 1990.

91. See the quote from *De Pot.*, IX, 1, footnote 83.

92. Smith and Kendzierski, *The Philosophy of Being*, p. 65.

then means the essence of a corporeal⁹³ being that is composed of matter and form, and the composite of substance, or essence and *esse* is the composite of the essential situation of an existent and its act-of-existing.

Existence (*esse*) is that by which a substance, material or immaterial, is a real being (*ens*). *Esse* stands to *ens* as act to potency. Now because every finite being is a composition of act and potency it does not exist necessarily; "it has or possesses existence which is distinct from essence as act is distinct from potentiality. The form determines or completes in the realm of essence, but that which actualizes essence is existence."⁹⁴ Aquinas himself puts the point this way.

... intellectual substances are not composed of matter and form: rather, in them the form itself is a subsisting substance; so that form here is *that which is* and being itself is act and *that by which* substance is. And on this account there is in such substances but one composition of act and potentiality, namely, the composition of substance and being, which by some is said to be of *that which is* and being, or of *that which is* and *that by which a thing is*. On the other hand, in substances composed of matter and form there is a twofold composition of act and potentiality: the first, of the substance itself which is composed of matter and form; the second, of the substance thus composed and being; and this composition also can be said to be of *that which is* and being, or of *that which is* and *that by which a thing is*.⁹⁵

In conclusion we can say that *esse*, or act-of-being, or act-of-existing, is the act by which essence or substance is or has being. Because it is neither matter nor form, and therefore neither a substantial nor an accidental form, it does not belong to the realm of essence. It is *that by which forms are*.

As an act, *esse* is metaphysically prior to essence, so much so that without *esse* there can be no essence. This is the main point of Thomistic metaphysics. Gerard Smith expresses it this way: "it is not *because* a subject of "is" is in an essential situation (though it is true it *is* in an essential situation) that it is an existent; rather it is *because* an essential situation is a situation of a subject of "is" that there *is* an

93. In the case of an immaterial finite being its essence is form alone.

94. Frederick Copleston, *A History of Philosophy*, Doubleday, New York, 1985, Vol. II, p. 332.

95. *Summa Contra Gentiles*, II, 54. By 'being' Aquinas here means *esse*.

essential situation, actual or possible.”⁹⁶ An example will show clearly that this is so and cannot be otherwise. It would be wrong to say that an existent is an existent because it is a human being for the simple reason that being an existent would then mean being a human, and then there could only be one human being. The reason why a human being *is* is because being a human is an essential situation of an existent. But how can there be many existents? The answer is a complex one and will take us into the discussion of causality.

There can be many existents if there can be many subjects of “is.” There can be many subjects of “is” if any such subject’s “is” is unidentical with that subject. Each subject’s “is” is unidentical with each subject if each subject’s essential situation is unidentical with its existential situation. Each subject’s essential situation is unidentical with its existential situation if multiplicity in the status of an existent is (a) a fact, actual or possible, and (b) if there be a cause of the fact or its possibility.⁹⁷

Now we must see why a cause is necessary for bringing about the multiplicity of existents. There are two reasons. First, that which is potential and becomes actual cannot become actual on its own. If the potential could actuate itself it would not be potential but actual; being potential, however, it is not actual. Secondly, given that the potential is unable to actuate itself, there has to be something that does the actualizing. That something is a cause. If, then, we want to explain the multiplicity “of the status of an existent in any order of given multiplicity: in the order of change, in the order of generation, and in the order of the status of an existent,”⁹⁸ we need a cause.

Aristotle had said the same thing except for the order of the status of an existent. Because for Aristotle the world is eternal there is no cause of its existence as such. This does not mean, however, that the world is not contingent. Prime Matter, which is eternal, is the material cause of things in the world, and they are

96. Smith and Kendzierski, *The Philosophy of Being*, p. 84.

97. *Ibid.* p. 88.

98. *Ibid.* p. 89.

actualized by their forms. Things are because of their forms. We saw above⁹⁹ that for Aristotle the most important cause is the final-formal cause, and his ultimate explanation of nature stops at essence, or nature. St. Thomas takes metaphysics to the final step. Although, as we have already said, for him the world is created, he does not find the doctrine of the eternity of the world preposterous.¹⁰⁰ To say that the world is created is to say that it has a creator. St. Thomas' account of creation and its creator is a lengthy and complicated one. I do not want to go deeply into it here. It will suffice for our purposes to show why for Thomas Aquinas things in the world need a cause that goes beyond their essence.

By showing this St. Thomas had gone beyond his predecessors.¹⁰¹ For them existence meant the existence of a particular essence. Such a view is only natural. All existing things that we directly know exist as this or that particular thing. But to say this is to say "that the essence of any and every thing is not existence itself, but only one of the many possible sharings in existence. This fact is best expressed by the fundamental distinction of "being" and "what is" so clearly laid down by Thomas Aquinas."¹⁰² By saying that "being" and "what is" are distinct St. Thomas does not mean that essence and existence are two distinct things like, for example, two human beings. He wants to say that existence is the act by which a thing at the same time *is* and is what it is. In other words, it is its cause. "This distinction merely expresses the fact that, in our human experience, there is no

99. See pp. 30-31.

100. Gilson, on this point, says, "I do not think I am betraying him if I say that, had he not learned to the contrary from divine revelation, Thomas Aquinas would have found it quite natural to think of the world as being now as it always was and always will be, world forever, because, were it so, such an absolutely eternal world would still remain an eternally contingent world whose actual existence still would remain an eternal gratuity. *Being and Some Philosophers*, Pontifical Institute of Mediæval Studies, Toronto, 1952. pp. 160-161.

101. Those who say that St. Thomas' philosophy is merely a rehash of Aristotelian doctrines either never read his doctrine of being, or they do not sufficiently understand it.

102. E. Gilson, *God and Philosophy*, Yale University Press, 1941. p. 70.

thing whose essence it is 'to be,' and not 'to-be-a-certain-thing.' The definition of no empirically given thing is existence; hence essence is not existence, but existence must be conceived as distinct from it."¹⁰³ Once things in the world are conceived in this way their existence must be accounted for, and it cannot be accounted for only by referring to their formal cause because their essence, or that which they owe to their formal cause, will not yield the answer to the question: Why are they? Essences only tell us what things are. Given that in all things in the world there is a distinction between their essence and existence none of their essence is "to be." They do not, therefore, contain in themselves the reason for their existence, but point to their only possible cause, that is, to a cause whose very essence it is "to be." To posit such a being as the cause of the world is to posit the Christian God whose philosophical name is "He Who Is".

Of Him it cannot be said that He is *by* his act-of-being. He is His act-of-being. Since we can only think in terms of being, and since we can grasp a being as an essence, we have to say that God has an essence. But we must hasten to add that what in Him serves as an essence is His act-of-being: *In Deo non est aliud essentia vel quidditas quam suum esse*. The act-of-being is the act of acts; it is the primary energy of a being and from it all operations proceed (*operatio sequitur esse*). Since God is very *Esse*, the operation belonging to Him and only to Him is the producing of acts-of-being. To produce an act-of-being is what we call creating. Creating is, therefore, action proper to God: *Ergo creatio est propria Dei actio*. And as it is as Act-of-Being that He alone has the power to create; the act-of-being is His proper effect: *esse est ejus proprius effectus*.¹⁰⁴

This then is St. Thomas' general conception of causality. It revolves around his doctrine of *esse*. His discussion of final causality will therefore involve this doctrine, and because it does it is significantly different from all previous discussions of final causality and therefore very important for our purposes here. We are now ready to take a closer look at it.¹⁰⁵

103. *Ibid.* pp.70-71.

104. Gilson, *The Christian Philosophy of St. Thomas Aquinas*, p. 371.

105. For this discussion I am going to rely primarily on Smith's and Kendzierski's *The Philosophy of Being*.

We said above that a cause is that which makes the potential to be actual. This definition implies three features of a cause. They are: "otherness,"¹⁰⁶ "actuality,"¹⁰⁷ and "efficiency"¹⁰⁸. Efficiency, however, is the most important for the discussion of finality because finality is one of the elements of efficiency.¹⁰⁹ Given that the efficient cause does the job that it does, that is, it does the causing, and that it does a particular kind of job, we are still left with having to explain why the efficient cause gets up, so to speak, and does the causing. Unless we can locate in the cause something that makes it act rather than not, something that is *prior* to the act of causing, the explanation of things in the world by a cause not only falls apart but it cannot even get off the ground. Exemplarity and actuality of a cause will not reveal to us what that something is. Efficiency must have another feature in addition to these two. That feature is *tendency*.

Let us take an old and common illustration of tendency: all bodies tend to push downwards. Everyone knows, at least from holding them, that bodies exert pressure or weight, and that letting go of them results in their falling down. What most of us usually never notice is that the force of pressure due to which the body later falls was in that body all along, that is, before we even let go of it. It was a constituent part of it, so that we can say that being a body means being something in which the force of pressure resides, or we can say, to be a body is to be heavy. All things that are bodies are heavy and as such fall, in a sense, even before they actu-

106. "A cause is "other" than the potential whose actuation it explains. This feature of a cause is called its "otherness."" Smith and Kendziarski, *The Philosophy of Being*, p. 89.

107. "The cause exists with the actuation which it confers upon the potential, e.g., a cause of water-becoming-hot, does not as a cause, become hot; it *is* hot. This feature of a cause is called its "actuality." The cause is *in* the actuation of that by which it will actuate the potential." *Ibid.* p. 90.

108. "A cause must *confer* or *bestow* upon the potential that which actuates the potential. This feature of a cause is called its efficiency or the exercise of the cause's causality." *Ibid.*

109. Exemplarity is another element of efficiency. We need not say much about it except that it is the "likeness or similarity of the cause to the effect." *Ibid.* p. 96.

ally (as a matter of fact) fall. In other words, they tend to fall before they fall. We can define tendency, then, as "prefixation of an agent upon operation even before the agent actually operates."¹¹⁰

Note that this prefixation in an agent upon operating does not tell us anything about the *kind* of operation it is going to be. What kind of an operation it is going to be, or its *nature*, depends upon formal causality. (Formal cause is responsible for *that into which* something is made.) Tendency is a prefixation upon acting just prior to the execution of an action. It is "the existential status of operation before there is operation."¹¹¹ Sometimes it goes under the name desire or appetite, or bent.

Saying that tendency is the existential status of an operation prior to there actually being an operation sounds like saying that an operation exists before it exists. In a manner of speaking it does exist before it exists, but as a tendency to operation. We must be careful how we understand this. If we use the word "nature" to describe the total situation, and understand what is meant by the word, we are likely to stay clear of misconceptions. "Nature is the name of an agent of a certain sort inasmuch as that kind of agent is about to give birth to, or to issue into, the actual exercise of a kind of operation which corresponds to the kind of agent it is - like a runner on his mark ready to run."¹¹² The example of a runner is a helpful one. We can think of the runner ready in his starting blocks as tendency, and so we can say that the "runner" is the nature and tendency, or his keying up to run.

An operation, then, has two prefixations explaining it: "(1) the prefixation of the agent's nature, which describes the kind that the operation will be; (2) the

110. *Ibid.* p.104.

111. *Ibid.*

112. *Ibid.* p. 105.

agent's prefixations, by tendency, upon operating rather than not, which explains an agent's operation."¹¹³ Smith suggests we call the nature-prefixation an essential determinant of action, and the tendency-prefixation the existential determinant of action.¹¹⁴

If we examine an operation closely we will see that it consists of three stages that are made up of an essential and an existential determinant: "(1) the stage before operation begins, where the essential determinant is the *kind* of agent in question, and the existential determinant is the agent's *tendency* to act according to the kind it is, (2) the stage of actual operation where there is *operation* of a fixed *kind*, (3) the stage at which by its operation an agent causes a *kind* of effect to *be* or exist."¹¹⁵

It is important that we do not think of these stages as three box cars of a freight train coming one after the other. We must think of the first stage as precontaining the second, and the second as precontaining the third. In other words, each moment of operation precontains potentially the act of the next moment. But when we are talking about causality we can ask which stage, the first or the third, is primary. The answer is not obvious. In fact, it is the opposite of obvious. We may be inclined immediately to answer that the first stage is primary because, after all, a cause precedes its effect. But this answer, while it is not false, given that the first stage is primary to the third stage in time and as the efficient cause of the third stage, does not address the real problem. We are trying to find out what causes the efficient cause to cause the third stage. A song writer, for example, *can* cause songs merely in virtue of the fact that he is a song writer. There is noth-

113. *Ibid.*

114. *See Sum. Theol.*, I-II, 1, 2; *Contra Gentiles*, III, 2.

115. *The Philosophy of Being*, p. 105.

ing problematic about that. But we do not know what causes the song writer to write songs. Is it the fact that he is a song writer? It could not possibly be because he does not become a song writer until he has written some songs. There must therefore be a cause of song writing.¹¹⁶ It can only be the song-as intended-by the songwriter which causes him or her to cause that song. We have now come to that cause which is the cause of the efficient cause's causality. Its name is *final cause*. In our example of the songwriter the song is the final cause; the song is the end which causes the songwriter to get up and go about his business of songwriting. It is not that the songwriter causes the song to be his end, but rather, "he causes the end of his operation to exist,"¹¹⁷ that is, he causes the song.

We may at this point feel inclined to ask how the song which is the effect can also be the cause. Is that not contradictory? It is true that the song is the effect when it in fact exists, but before its actual existence the end exists in the intention of the songwriter, and that is where the end acts as a cause. That is why we can say that stage three is prior to stages one and two; it is prior in *esse*, that is, in the act-of-existing. We are certainly not saying that stage three, as a physical existent, is prior to stage one. If there is no song there is no song. It is true, however, to say that a song exists in the songwriter's intention to make a song. "Thus it is stage (3) as *intended* by agents which is prior, but not in time or efficiency, to

116. The moderns may see this as unnecessary hair splitting, or as an endless and fruitless debate, much like the fictional debate about how many angels can dance on a pinhead. But it is of utmost importance to isolate the cause of efficient cause's causality in order to see what makes the efficient cause do the job of causing. To leave out this cause is to fail to explain fully efficient cause's causality. We will see in a moment why that is so.

As to the question concerning the angels "that problem had never occupied the attention of a single thinker in the Middle Ages when angelology was so fully developed. It was not among the disputed questions that scholastic theologians and philosophers have been traditionally supposed to wrestle with in endless--and fruitless--debate. The myth that intense discussion focussed on the number of angels that might dance on a pinhead is simply one of the many modern inventions contrived to make a mockery of mediæval thought." Mortimer J. Adler, *The Angels And Us*, Macmillan Publishing Company, New York, 1982. p. 101.

117. *The Philosophy of Being*, p. 107.

stage (2) and (1). This is to say that the final cause is prior in intention to the causality, stage (1) and (2), of the efficient cause. Thus a final cause is the very capstone of efficient causality."¹¹⁸ To explain things, therefore, merely in terms of efficient causality is not to explain them at all. A fuller explanation is necessary. In his *In V Metaph.*, lect. 2, n. 775 St. Thomas gives the reason why this is so, and it is fitting that we let him have the last word.

We ought to understand that of the four causes previously mentioned, two of them correspond to each other, and the other two also. For the efficient cause and the end correspond to each other, in that the efficient cause is the principle of change, and the end is its term. Similarly, matter and form correspond to each other, for the form gives *esse*, but the matter receives it. Therefore, the efficient cause is the cause of the end, and the end is the cause of the efficient cause.¹¹⁹ The efficient cause is the cause of the end, in as much as it makes it to be, because by bringing about change, the efficient cause makes the end exist. But the end is a cause of the efficient cause, not indeed of its being, but with regard to its causality. For, the efficient cause is a cause in as much as it acts, and it does not act except for the sake of an end. Therefore the efficient cause has its causality from the end.

It remains for us only to say something about our knowledge of ends. We know that all operations have ends, and to that extent we are certain of them. But we do not always know fully what those ends are. For example, we know that the eye is for seeing, but our knowledge of seeing is far from perfect.

How, it may be asked, can we be certain that every operation has an end even though we do not fully know it? Aristotle's description of an end is the answer: "it is that which every thing for its own part seeks", or "that on account of which there is operation."¹²⁰ Because to seek is necessarily to seek something, that is, the end, we can be certain of the end even if we do not fully know what it is, nor exactly why a thing seeks it.

We will let this suffice as the ancient and mediæval accounts of final causality

118. *Ibid.*

119. This is the point that allows us to see why an explanation in terms of efficient causality alone is not much of an explanation. Efficient cause has a cause, the end, which must therefore be included in any adequate theory of causation.

120. See Aristotle, *Nicomachean Ethics*, I, 1, 1094a 2, and *Physics*, II, 3, 194b 32-28.

and will now turn to some modern criticisms of final causality.

CHAPTER III

SOME MODERN CRITICISMS OF TELEOLOGY

No other principles are required in physics than are used in Geometry or Abstract Mathematics, nor should any be desired, for all natural phenomena are explained by them.

RENE DESCARTES, *Principles* II, 64

But as soon as I had acquired some general notions concerning Physics, and as, beginning to make use of them in various special difficulties, I observed to what point they might lead us, and how much they differ from the principles of which we have made use up to the present time, I believed that I could not keep them concealed without greatly sinning against the law which obliges us to procure, as much as in us lies, the general good of all mankind. For they caused me to see that it is possible to attain knowledge which is very useful in life, and that, instead of the speculative philosophy which is taught in the Schools, we may find a practical philosophy by means of which, knowing the force and the action of fire, water, air, the stars, heavens and all other bodies that environ us, as distinctly as we know the different crafts of our artisans, we can in the same way employ them in all those uses to which they are adopted, and thus render ourselves the masters and possessors of nature.

RENE DESCARTES, *Discourse on the Method*, VI

Most historians of philosophy regard Francis Bacon and Rene Descartes as the two founders of modern philosophy; Bacon in England and Descartes in France. The term 'modern' implies that there is a break from mediæval and ancient philosophy; a break that marks some fundamental differences between mediæval and post-mediæval systems of philosophy. One of the ways in which this difference manifests itself is in the rejection by modern philosophers of nature of Aristotelian teleology. In this chapter we will consider some of the reasons given by three modern philosophers for their rejection of Aristotle. The philosophers are Bacon, Descartes, and Boyle. Even though these philosophers' positions differ from one another they all reject Aristotle's doctrine. This common feature will serve as an occasion for answering the central question¹²¹ as well as a springboard for some critical remarks. Let us begin by considering what each of these philosophers has

¹²¹. See p. 15.

to say on the topic of final causality.

Bacon's Criticism of Final Causality

I mentioned above¹²² that the moderns often displayed aversion to the Aristotelian tradition, and even to Aristotle himself. Francis Bacon is no exception. In his *Advancement of Learning* he divides up the sciences according to the different branches of human knowledge. In Book III he discusses philosophical kinds of knowledge, and in chapter IV of the same book he maps out the speculative branch of natural philosophy. It is here that he discusses final causality. The speculative or theoretical branch of natural philosophy, he says, has two parts: physics and metaphysics. He is quick to point out, however, that he is using the word "metaphysics" differently from the way it is usually used. Without giving us a reason for the change in the use of the word he proceeds to tell us of his loyalty to the ancient forms of expression: a loyalty that he finds lacking in Aristotle.

. . . it is our desire, as much as possible, not to deviate from ancient opinions and forms of speech. And here I cannot but wonder that Aristotle should proceed in such a spirit of contradiction, as he did to all antiquity: not only coining new terms of science at pleasure, but endeavoring to abolish all the knowledge of the ancients; so that he never mentions any ancient author but to reprove him, nor opinion but to confute it; which is the ready way to procure fame and followers. For certainly it happens in philosophical, as it does in divine truth: "I came in the name of my Father, and ye received me not; but if one came in his own name, ye would receive him." Which divine aphorism, as applied to Antichrist, the great deceiver, plainly shows us that a man's coming in his own name, without regard to antiquity or paternity, is no good sign of truth, though joined with the fortune and success of being received. But for so excellent and sublime a genius as Aristotle, one would think he caught this ambition from his scholar, and affected to subdue all opinions, as Alexander did all nations; and thus erect himself a monarchy in his own contemplation.¹²³

Aristotle, it seems, is to be blamed for, among other things, giving new terms to new ideas. Bacon thinks it is better "religiously to side with antiquity, and therefore to retain ancient terms, though we frequently alter their sense."¹²⁴

122. See pp. 12-13.

123. Francis Bacon, *Advancement of Learning*, p. 146.

124. *Ibid.* p. 147.

Altering the sense of terms is in fact what he does. He retains the use of terms like "philosophy" and "metaphysics," but these now mean something considerably different they do in the Aristotelian tradition. Frederick Copleston explains the shift.

Metaphysics was for him neither the study of being as being nor a contemplation of un-moving final causes; it is rather the study of the most general principles or laws or "forms" of the material world, and this study is undertaken in the view of a practical end. His conception of philosophy was to all intents and purposes naturalistic and materialistic. . . . Bacon made a sharp division between theology and philosophy, not simply in the sense that he made a formal distinction between them but also in the sense that he accorded full liberty to a materialistic and mechanistic interpretation of nature. The philosopher is concerned with what is material and with what can be considered from the mechanistic and naturalistic point of view. Bacon may have spoken occasionally in more or less traditional terms about natural theology, for example, but it is clear that the real direction of his thought was to relegate the immaterial to the sphere of faith.¹²⁵

Copleston's point can be seen in the following text from *Advancement of Learning*. Even though Bacon may appear to be speaking in traditional terms the real direction of his thought is apparent.

. . . we must note, that as physics regards the things which are wholly immersed in matter and movable, so metaphysics regards what is more abstracted and fixed: that physics supposes only existence, motion, and natural necessity, while metaphysics supposes also mind and idea. But to be more express: as we have divided natural philosophy into the investigation of causes, and the production of effects, and referred the investigation of causes to theory, which we again divide into physical and metaphysical: it is necessary that the real difference of these be drawn from the nature of the causes they inquire into: and therefore, plainly, physics inquires into the efficient and the matter, and metaphysics into the form and the end.¹²⁶

This shift in the conception of philosophy (particularly natural philosophy) requires an explanation. Bacon thought that the inquiry of final causes in physics was "ill-placed" because it drove out of physics the inquiry of physical causes, "and made men rest in specious and shadowy causes, without ever searching in earnest after such as are real and truly physical."¹²⁷ The main reason, then, for banishing final causes out of physics is so they would not hinder the discovery of, what Bacon calls, "physical causes." For example, he thinks that Aristotle's claim

125. Frederick Copleston, *A History of Philosophy*, Vol. III, pp. 299-300.

126. *Ibid.* pp. 147-8.

127. *Ibid.* p. 165.

that "the hairs of the eyelids are to preserve the sight" is not in any way contrary to the claim that "pilosity is incident to the orifices of moisture." It would be better, Bacon thinks, if physicists channeled their efforts exclusively to the kind of inquiry that yields practical results from which the whole humanity would benefit. In other words, physicists should find out *how* things in nature operate in order to find the best ways of manipulating them for man's practical use. The *why* of things thus becomes unimportant to them, and Aristotle's claim that hairs of the eyelids protect the sight loses all scientific value. In the preface of his *Great Instauration* Bacon states the aim of his work. ". . . I am labouring to lay the foundation, not of any sect or doctrine, but of human utility and power."¹²⁸ He saw power over nature as the ultimate end of science, and utility as the driving force behind it.

Of all signs there is none more certain or worthy than that of the fruits produced, for the fruits and effects are the sureties and vouchers, as it were, for the truth of philosophy. . . Truth, therefore, and utility are here perfectly identical, and the effects are of more value as pledges of truth than from the benefit they confer on men.¹²⁹

Given Bacon's conception of the purpose of science it is not surprising to hear him say "inquiry into final causes is sterile, and like a virgin consecrated to God, produces nothing."¹³⁰ If truth and utility are indeed one, his objection against final causality is certainly justifiable. The contemplation, by the ancients, of final causes in nature, it seems to Bacon, resulted in the neglect of material and efficient causes; the knowledge of which can yield practical usefulness. It also fooled them into thinking that they had understood nature when "they had only admired it."¹³¹

128. From *The New Organon and Related Writings*, ed. by F. H. Anderson, The Liberal Arts Press, New York, 1960. p. 16.

129. *Novum Organum*, book I, aphorisms 73 and 124. From *Advancement of Learning and Novum Organum* by Francis Bacon, P. F. Collier & Son, New York, 1900.

130. *Advancement of Learning*, III.5.

131. Gilson, *From Aristotle to Darwin*, p. 23.

Formal causes, in the Aristotelian sense, are no more welcome by Bacon than final causes. Even though he thinks that formal causes belong to metaphysical inquiries, he has a different meaning for the term "form" than Aristotle did. He means by it something called "fixed laws." Thus for example, the form of density is the law of density. He is not interested in the form of a thing like an oak, a lion, or water, but in the form of heat, cold gravity, density, and "other schemes of matter and motions."

But to resolve nature into abstractions is less to our purpose than to dissect her. . . . Matter rather than forms should be the object of our attention, its configurations and changes of configuration, and simple action, and law of action or motion: for forms are figments of the human mind, unless you will call those laws of action forms.¹³²

Metaphysics is for Bacon merely a general part of what used to be called physics. The new physics is now seen as superior to metaphysics because it deals strictly with material and efficient causes. These causes make physical knowledge possible, which in turn makes possible new inventions by telling us how things function. Formal and final causes, being abstract, are thus useless.

There is one other comment of criticism directed by Bacon at Aristotle. Aristotle, says Bacon, is to blame for "banishing God, the fountain of final causes, and substituting nature in his stead; and, at the same time, receiving final causes through his affection to logic, not theology."¹³³ This line of criticism reveals Bacon's understanding of Aristotle as one who saw no relation between God and the world. That is indeed why he says that "Aristotle had no need of a God, after having once impregnated nature with final causes, and laid it down that 'nature does nothing in vain; always obtains her ends when obstacles are removed.'"¹³⁴

I will reserve my evaluation of Bacon's criticism for the next chapter, and will

132. *Novum Organum*, book I, aphorism 51.

133. *Advancement of Learning*, pp. 166-7.

134. *Ibid.* p. 167.

now turn to Descartes' criticism of final causality.

Descartes' Criticism of Final Causality

Though Descartes' and Bacon's positions on final causality may differ there is a similarity in their approaches to philosophy which may account for their rejection of final causes in physics. This similarity, it may be argued, stems from two points they have in common. According to Gilson they are: "their taste for knowledge that is practical and useful, and their indifference concerning philosophical notions which, though, perhaps true in themselves, do nothing to increase our power over nature."¹³⁵ In a nutshell, their philosophies are oriented toward practical knowledge where primacy is given to action rather than contemplation. That this is true with respect to Descartes is evident in the quote at the beginning of this chapter from *Discourse on Method*. When Descartes speaks of final causality, and those are not numerous occasions, the emphasis on the usefulness of knowledge is also evident.

When I set out on this project I hoped to be able to find passages, or at least a single passage, where Descartes gives his conception of final causality. I did not find one. Having such a passage would make the attempt to understand what it was about final causality that prompted him to reject it in his physics¹³⁶ considerably easier. It would also help in deciding whether Descartes was working with the same notion of final causality as Aristotle and Aquinas or whether he had a different notion. But having no such passage I am forced to conjecture about what

135. *From Aristotle to Darwin and Back Again*, p. 17.

136. I am going to restrict, for the moment, the discussion of Descartes' rejection of final causality to the realm of natural sciences. Later it may be necessary to pay some attention to Gilson's claim that Descartes not only denied the existence of final causality in nature, but that he "had gone so far as to deny its presence in the thought of the Creator himself." (*From Aristotle to Darwin*, p. 22)

Descartes has to say on final causality.

Let us begin by looking at some passages where Descartes talks about final causality. In his attempt to understand (in *Meditation IV*) why he is subject to error Descartes notices that there are things that he is not only mistaken about, but incapable of comprehending. He specifically has in mind the reason why God acts as he does. Also, the reasons why God produced many things Descartes finds hidden from him. We should not be surprised, therefore, that we cannot know anything about final causes.

... knowing that my nature is extremely feeble, and limited, and that the nature of God is on the contrary immense, incomprehensible, and infinite, I have no further difficulty in recognizing that there is an infinitude of matters in His power, the causes of which transcend my knowledge; and this reason suffices to convince me that the species of cause termed final, finds no useful employment in physical [or natural] things; for it does not appear to me that I can without temerity seek to investigate the [inscrutable] ends of God.¹³⁷

We can extract from this passage several of Descartes' reasons for abandoning considerations of final causality. It would appear that Descartes equates final causes with something called "ends of God." As far as I can tell, he means by that the purposes which God had designated for the things he created. A philosopher cannot understand what these ends are because human intelligence is "not capable of comprehending why God acts as He does,"¹³⁸ nor is it able to understand "for what reason God produces"¹³⁹ many things. The reason why we cannot grasp these things is because ours is an "extremely feeble and limited" nature. The main reason why, according to Descartes, final causes should be left alone is that they cannot be grasped. The second reason is that such unknowable causes have "no useful employment in physical [or natural] things." What exactly Descartes means

137. Rene Descartes, *Meditation IV*, from *The Philosophical Works of Descartes*, Vol. I, trans. by E. S. Haldane and G. R. T. Ross, p. 173.

138. *Ibid.*

139. *Ibid.*

by “useful employment” we can only guess. But we will probably not be far off the mark if we assume that he has in mind practical applications by which we can become “masters and possessors of nature.” In other words, considering final causes is a fruitless activity, fruitless in the sense of not yielding the kind of knowledge that will promote practical ends. Finally, Descartes seems to think that investigating final causes cannot be done without temerity or recklessness because of our feeble and limited nature. The ends of God are so inscrutable that investigating them can only result in our making rash and dangerous conclusions about them. We are much better off simply leaving final causes alone.

These claims did not go unquestioned in Descartes’s day. Gassendi, in his letter to Descartes, addresses himself to the above excerpt from *Meditation IV*. Descartes’ reply to Gassendi contains a further discussion on final causality. For that reason their correspondence is worth our consideration here. Let us consider, then, Gassendi’s objections to Descartes on this point as well as Descartes’s replies and see what more we can learn about Descartes’ rejection of final causality.

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Gassendi’s main difficulty with Descartes’ refusal to consider final causes in Physics is that it does damage to natural theology. Admitting that the rejection of final causes may “perhaps in another situation have been quite correct,”¹⁴¹ Gassendi tells Descartes that “in treating of God, it is really to be feared that you have rejected the principal argument whereby the Divine wisdom, foreknowledge, power and existence as well, may be established by our natural light.”¹⁴²

140. I have numbered Gassendi’s objections one to three. This is my own invention and it does not appear so in Gassendi’s letter.

141. Gassendi does not say what that situation would be.

142. *Philosophical Works of Descartes, Vol. 2, Letters and Objections*, trans. by E. S. Haldane and G. R. T. Ross, Dover Publications, New York, 1955. p. 175.

Anticipating Descartes' reply that it is better to concern ourselves with material and agent (efficient) causes, Gassendi points out some shortcomings of an investigation guided by these two causes and asks what prevents a natural philosopher when, for example, looking at the human heart "from at least admiring that most excellent contrivance and the marvellous providence which has given us valves accurately adapted to that design?"¹⁴³

Finally, Gassendi wants to know why must it be the case that investigating God's purposes is always rash. He thinks it need not always be so. He admits that such an investigation may be rash when it comes to purposes "which God Himself wished hidden or of which He has prohibited the investigation, it is nevertheless, certainly not so, in the case of those which He has, as it were, placed publicly before us, which with little labour come to light, and are besides such as to procure great praise for God Himself, as for their author."¹⁴⁴

Descartes, it seems, replies to only the first and the last objection, but we can guess without much difficulty what his reply to the second objection would be. To the first objection Descartes replies in the following way.

The arguments you adduce on behalf of final causality are to be referred to the efficient cause: thus it is open to us, from beholding the uses of various parts in plants and animals to regard with admiration the God who brings these into existence, and from a survey of His works to learn to know and glorify the author of these works, but that does not imply that we can divine the purpose for which he made each thing.¹⁴⁵

The reply to the third objection may serve as a clue to Descartes' possible answer to the second objection. The reason why it is always rash to investigate God's purposes is that "we cannot pretend that certain of God's purposes rather than others are openly displayed; all seems to be equally hidden in the abyss of

143. *Ibid.* p. 176.

144. *Ibid.*

145. *Ibid.* p. 223.

His inscrutable wisdom.”¹⁴⁶ For the same reason, it seems we cannot really be admiring “that most excellent contrivance and the marvellous providence.” That is, we cannot admire it because we cannot know it.

From the reply to Gassendi’s first objection it is obvious that Descartes is content to trade all talk of purpose and goal in nature for arguments from efficiency. Thus, instead of admiring the purpose or purposes for which the parts of things work, we can admire the workings of each part and the uses that a thing makes of its parts. The *how* of a thing is now more important than the *why* of it. And God is now to be admired, not as the end of creation, but primarily as the author of it.

We must now stress more clearly Descartes’ main reason for his rejection of final causality. In his reply to Gassendi Descartes does not explicitly state the reason but he seems to be assuming it when he argues against investigation of final causes. For example, when he says that we cannot know any of God’s purposes, and that all is “equally hidden in the abyss of God’s inscrutable wisdom,” he does not say why we cannot know the purposes nor why they are hidden from us. The same is true of his following statement.

And although in Ethics, where it is often allowable to employ conjecture, it is at times pious to consider the end which we may conjecture God set before Himself in ruling the universe, certainly in Physics, where everything should rest upon the securest arguments, it is futile to do so.¹⁴⁷

Here he is implying that final cause arguments are not secure and for that reason it is futile to employ them in physics.¹⁴⁸ Such arguments are not secure because God’s purposes cannot be known. But why they cannot be known he does not say. For the answer to that question we must go back to *Meditation IV*. It is because

146. *Ibid.*

147. *Ibid.*

148. He does not seem bothered, however, by the use of such arguments in Ethics. It seems he allows for not so secure arguments in Ethics. It is not surprising, then, that Descartes did not make as much of an impact in the field of ethics, as Kant, for example, did.

our nature is feeble and limited and God's is infinite and incomprehensible. This reason must be kept in mind if Descartes' arguments in his reply to Gassendi are going to be at all plausible.

Descartes gives a similar argument in *Principles of Philosophy*. He opens the third part of his *Principles* with a two-part advice on how to philosophize correctly.

The first is that we must ever keep before our minds the infinitude of the power and goodness of God, and not fear to fall into error by imagining His works to be too great, too beautiful, and too perfect, but that on the contrary, we must take care lest, if we suppose any limits to exist in them of which we have no certain knowledge, we may seem to be insufficiently sensible to the greatness and power of the Creator.

The second is that we ought to beware lest we think too highly of ourselves. This we should appear to do if we supposed the universe to have certain limits not presented to our knowledge without at the same time being assured of the fact by divine revelation, which would be making our knowledge extend beyond that which God has made: but this would be even more so if we persuaded ourselves that it was only for us that all things were created by God, or even were we to suppose that by the powers of our mind we could comprehend the end which He set before Himself in creating the universe.¹⁴⁹

This pious rule looms in the background whenever Descartes talks about the investigation of final causes. God is too great and we are too weak to pretend to know the ends of God. But ends are the very things which the investigation of final causes is searching. It is therefore a vain search. Furthermore, physics ought to rest only on principles that are as certain as those in mathematics and geometry, and final causes cannot be known at all, let alone with a high degree of certainty. We are much better off, then, not bothering with them at all.

In his conversation with Burman, one of Descartes' correspondents, we come across another of Descartes' reasons for rejecting final causes. This reason is again coupled with the one we have just seen, but we also get another aspect of it.

This rule--that we must never argue from ends--should be carefully heeded. For, firstly, the knowledge of a thing's purpose never leads us to a knowledge of the thing itself: its nature remains just as obscure to us. Indeed, this constant practice of arguing from ends is Aristotle's greatest fault. Secondly, all the purposes of God are hidden from us, and it is rash to want to plunge into them. I am not speaking here of the purposes

149. *Philosophical Works of Descartes*, Vol I, p. 270.

which are known through revelation; it is purely as a philosopher that I am considering them. It is here that we go completely astray. We think of God as a sort of superman, who thinks up such and such a scheme, and tries to realize it by such and such means. This is clearly quite unworthy of God.¹⁵⁰

The uselessness of final causes for determining the nature of a thing seems to be the reason here. Whether or not the ancient philosophers considered final causes for that reason will be considered in the next chapter. At this point we are only interested in what Descartes thinks of final causality.

From the above passage we also see that he thinks the investigation of final causes to be assuming a kind of anthropomorphizing of God. Philosophers who, as it were, play with final causes, says Descartes, are thinking of God as someone who accomplishes his purposes by instilling into his creation the means to accomplish it. To do that is to belittle God, that is, it is unworthy of God to do that. It sounds like something we would do, not God. But it seems that Descartes is now taking a position not quite compatible with his reply to Gassendi. There he says that God's purposes are hidden from us in the abyss of his wisdom, but here he seems to be denying that God has any purposes. This may be one of the texts that prompted Gilson to say that Descartes denies the presence of final causes in God's thought. Gilson, unfortunately, and uncharacteristically, does not point to any texts in support of his claim, so we can only guess. I will address this point again in the next chapter.

But if having and carrying out purposes is unworthy of God, what is, according to Descartes, worthy of God as the Creator? For this we must turn to his *Discourse on the Method*. This may be another text that prompts Gilson to make his claim. In part V Descartes reveals, although somewhat cautiously and cleverly, his conception of God's creative activity. He is careful not to say that this is

150. *Descartes' Conversation with Burman*, trans. by John Cottingham, Clarendon Press, Oxford, 1976, pp. 19-20.

how he thinks our world to have been created, but there is little doubt that this is only a precautionary measure resulting from his having heard of Galileo's condemnation. Besides what would be the point of telling us his view of how things would be instead of how things are? We can take the following text, then, to be his view of God's creative activity.

... I have also observed certain laws which God has so established in Nature, and of which he has imprinted such ideas on our minds, that, after having reflected sufficiently upon the matter, we cannot doubt their being accurately observed in all that exists or is done in the world.

... I resolved to leave all this world to their disputes, and to speak only of what would happen in a new world if God now created, somewhere in an imaginary space, matter sufficient wherewith to form it, and if he agitated in diverse ways, and without any order, the diverse portions of this matter, so that there resulted a chaos as confused as the poets ever feigned, and concluded His work by merely lending his concurrence to Nature in the usual way, leaving her to act in accordance with the laws which He had established.

... I tried to demonstrate all those [laws] of which one could have any doubt, and to show that they are of such a nature that even if God had created other worlds, He could not have created any in which these laws could fail to be observed.¹⁵¹

God's creative activity, it seems, consists of providing matter and the laws by which this matter arranges itself into what we see around us and continues to exist as such. These laws are like the laws of mathematics and geometry. We need not bother with these fictitious "forms or qualities which are so debated in the Schools;"¹⁵² or as he says elsewhere, "there are no occult forces in stones or plants, none of these stupendous and miraculous sympathies and antipathies, in fact nothing in the whole universe (*in natura universa*) need be referred to anything but purely physical causes--i.e. ones completely independent of mind and thought."¹⁵³ Everything can be explained in terms of universal and quantitative properties of

151. This is a strange statement coming from a creature of an "extremely feeble and limited nature" about an "immense, incomprehensible, and infinite" God. *Philosophical Works of Descartes, Vol. 1*, pp. 106-108.

152. *Ibid.* p. 107.

153. *Principles of Philosophy*, IV, 187, from Jonathan Ree's *Descartes*, Allen Lane, London, 1974, p. 43.

material particles: properties like size, movement, shape and arrangement. If that is the case, there is no need to dabble in final causes. We can add, then, another of Descartes' reasons for dismissing final causes: the physical laws of nature are sufficient for explanations in physics.

The above excerpts from the *Discourse* can be seen as Descartes' denial of any purposive activity in God's creation of the world. Even though he does not come out and say it, he does not ascribe to God anything more than the act of providing matter and the laws by which it arranges itself into things. Descartes also thinks that he has a clear understanding of what those laws are, and judging from the above text in his conversation with Burman, these laws cannot be the carriers of God's purposive activity. It looks as though Gilson may very well be right in his claim.

There are two more texts we should consider. One is a letter to Hyperaspistes and the other to Chanut. To the former he says:

It is self evident that we cannot know God's purposes unless God reveals them. From the human point of view adopted in ethics, it is true that everything was made for God's Glory, in the sense that we must praise God for all that he has made; and it is true that the sun was made to give us light. But it would be childish and absurd for a metaphysician to assert that God, like some vainglorious human being, had no other purpose in making the universe than to win men's praise; or that the sun, which is many times larger than the earth, was created for no other purpose than to give light to man, who occupies a very small part of the earth.¹⁵⁴

The conception of final causality which Descartes is criticizing here seems to be one that equates the purposes in nature with human purposes. Judging from what he says in this letter it is not clear whether he is very opposed to this kind of finalism, for he admits that "the sun was made to give us light." He is, however, opposed to thinking that this is a complete account of finality. He has more to say on the subject in his letter to Chanut six years later.

154. *Descartes - Philosophical Letters*, trans. by Anthony Kenny, Clarendon Press, Oxford, 1970, (Letter to Hyperaspistes, August 1641) pp. 117-118.

We may say that all created things were made for us in the sense that we may derive some utility from them; but I do not know that we are obliged to believe that man is the end of Creation. On the contrary, it is said that all things were made for his (God's) sake: God alone is the final as well as the efficient cause of the universe. *And since creatures serve each other, any of them might ascribe to itself a privileged position and consider that whatever is useful to it was made for its sake.*

Preachers, striving to incite us to the love of God, often lay before us the various benefits we derive from other creatures and say that God made them for us; they do not consider the other ends for which He might be said to have made them because this would be irrelevant to their purpose. *This makes us very inclined to think that God made all these things for us alone.*¹⁵⁵

This time his position seems more clear. The only thing he is willing to admit is that God is the end of Creation. It cannot be proved. Descartes thinks, that things in nature exist primarily for the sake of man. They may very well have other purposes. What these are God only knows. If, then, we cannot be certain of what the purposes in nature are, there is no point in considering them in physics where what is desirable are clear and distinct ideas with certainty like that of mathematics and geometry.

These reasons against the investigation of final causes exhaust, I think, Descartes' criticism of teleology.

Boyle's Criticism of Descartes' Rejection of Final Causality

Boyle sees the opposition to the inquiry into final causes as coming from two main camps.¹⁵⁶ On the one side are the Epicureans who operate on the assumption that the world is a product of atoms coming together by chance, and is therefore

155. *Ibid.* pp. 222-223. Italics are mine. They indicate the sentences which reveal Descartes' thinking that purposiveness is an invention of thinking creatures. It is also clear from the way Descartes talks here that he conceives of finality in its extrinsic sense: God is the final cause of Creation. In other words, a creature's end lies outside it. This, as we have seen in the chapter on Aristotle, is not the complete story of finality.

156. I am using for the following discussion, Robert Boyle, *The Works*, ed by. Thomas Birch, Georg Olms Verlagsbuchhandlung, Hildesheim, 1966. Vol. V. I will concentrate exclusively on *A Disquisition About the Final Causes of Natural Things: Wherein it is inquired, Whether, and (if at all) with what Cautions, a Naturalist should admit them?* which begins on p. 392.

independent of any purpose giving Deity. On the other side are the Cartesians who, because they see God as omniscient and themselves as not, think that inquiring into final causes is rash and presumptuous. How, they wonder, can man know, or even attempt to know, the ends that God has intended for his creatures? Boyle thinks it not worth the effort to comment on the Epicurean position and decides instead to propose a view contrary to that of the Cartesians. He finds this more appropriate because the Cartesian argument has become prevalent in his day. He does not, however, claim to be able to prove Descartes wrong; he is content simply to offer another position, one that he thinks more correct.

With his project set up in this a way he proceeds by way of answering four questions: 1. Are there any final causes in material things that can be known by philosophers of nature? 2. Can we speak of final causes with respect to all bodies or only some? 3. Can it be said that unintelligent, or even inanimate, bodies act for ends? 4. How far can we carry arguments from final causes? Summarizing Boyle's answers to these questions will give us his position on final causality, as well as his criticism of Descartes.

Boyle answers the first question affirmatively. He sees the ends of nature as being fourfold: "the universal ends of God or nature, cosmical or systematical ends, animal ends, and human ends."¹⁵⁷ The universal ends of God are the ends of the world as a whole that display God's power and communicate his goodness. These incite in intellectual creatures praise and admiration for their God. The cosmical ends are "the number, fabric, placing, and ways of moving the great masses of matter, that, for their bulk or qualities, are considerable parts of the world."¹⁵⁸ Boyle here has in mind things like the sun, moon, stars, earth and its two main

157. *Ibid.* p. 396.

158. *Ibid.*

parts, the sea and land. These, it seems to him, are placed in such a way as to preserve themselves, as well as to promote the good of the whole world. By "animal ends" Boyle means the parts of animals that contribute to the welfare of the whole animal. Finally, the human ends are those animals and vegetables, and other productions of nature, that man finds useful.

According to Boyle, these are the things we are talking about when we talk about final causes in nature. It is the knowledge of these things that Descartes thinks we cannot have because they are the ends of God. Boyle suggests there are two ways whereby man can know the ends of God: he can say he knows only some of the ends in only some of the things, or he can say he knows them all. To say that we can know God's ends in the former way, says Boyle, is not rash or presumptuous, but saying that we can know them in the latter way is. Descartes made a mistake when he pronounced all of God's ends to be hidden in the abyss of his Wisdom.

For there are some things in nature so curiously contrived, and so exquisitely fitted for certain operations and uses, that it seems little less than blindness in him, that acknowledges, with the Cartesians, a most wise Author of things, not to conclude, that they may have been designed for other (and perhaps higher) uses, yet they were designed for this use.¹⁵⁹

An eye, for example, seems clearly to have been made, at least, for seeing. It is not rash, then, to think that God intended it to be for that purpose. Epicureans have an excuse for not attributing vision to God's design, but the Cartesians who admit that God is the Creator of everything have none. In answering whether a philosopher of nature may speak of final causes with respect to all bodies, Boyle first divides all bodies into animate and inanimate. Arguments for the ends of animate bodies can be constructed from the uses they make of their parts provided

159. *Ibid.* p. 397.

some precautions are taken when these arguments are being put forth¹⁶⁰.

When arguing for the ends of inanimate bodies the natural philosopher must turn his attention to those here on earth and those in the heavens. The former will give the philosopher more trouble in his attempt to learn their ends because these (stones, liquids, etc.) do not possess any principles of growth or development. The celestial bodies, like the sun, moon, and the stars, on the other hand, reflect God's power "by the immensity of their bulk, and the celerity of their motions, and also figure his wisdom and general providence as to them; because he has for so many ages kept so many vast vortices, or other masses of matter, in scarce conceivable rapid motions, without destroying one another, or losing their regularity."¹⁶¹ But Boyle is cautious when he says that although it may be that one of the ends of the celestial bodies is the service of man, it cannot be inferred merely by contemplating them that that is their only or chief end. Philosophy of nature alone will not discover much about the ends of inanimate bodies. But, Boyle points out, the revelation of the Holy Scriptures will tell us more about the ends of God.

In attempting to answer the third question, whether unintelligent, or even inanimate, bodies act for ends, Boyle finds it necessary first to clear a serious difficulty. He sums up the difficulty in this way: "... the greater part of bodies being void of knowledge and life, it seems not conceivable, how they should act constantly for ends they are not capable of predesigning, and appositely employ means, that they have no knowledge, wherewith to make choice of."¹⁶² Aristotle, says Boyle, was fully aware of this difficulty, but instead of attempting to solve it he cleverly avoided it.

160. Boyle discusses these precautions at the end of his essay. They are not of particular importance to our purpose here.

161. *Ibid.* pp. 410-411.

162. *Ibid.* p. 413.

Boyle's own solution involves a distinction between two ways in which it can be said that a body acts for an end.

one, when the agent has a knowledge of that end, and acts with an intention to obtain it; as when a man shoots an arrow to hit a mark: the other is, when the action of the proximate agent is indeed so directed, as it ought to be to obtain an end, and yet that end is neither known nor intended by the proximate agent, but by a remoter agent, that is intelligent.¹⁶³

With this distinction in hand it becomes immediately clear that inanimate bodies, being incapable of knowledge, cannot be said to act for an end. We are left with the second sense when considering the action of inanimate bodies. Here, however, we are not speaking properly when we say that they "act" for an end. We must rather attribute the action to a remoter, intelligent agent, that is to say, to God.

Boyle explains what he means in one long sentence.

the most wise and powerful Author of nature, whose piercing sight is able to penetrate the whole universe, and survey all the parts of it at once, did, at the beginning of things, frame things corporeal into such a system, and settled among them such laws of motion, as He judged suitable to the ends He proposed to Himself in making the world: and as by virtue of his vast and boundless intellect, that He at first employed, He was able not only to see the present state of things He had made, but to foresee all the effects, that particular bodies so and so qualified, and acting according to the laws of motion by Him established, could in such and such circumstances have on one another: so, by the same omniscient power, He was able to contrive the whole fabric, and all the parts of it, in such manner, that, while his general concourse maintained the order of nature, each part of this great engine, the world, should, without either intention or knowledge, as regularly and constantly act towards the attainment of the respective ends which He designed them for, as if themselves really understood, and industriously prosecuted, those ends.¹⁶⁴

It seems, then, that for Boyle final causes are synonymous with purposes intended by intellectual beings. Non-intellectual, and non-living, things do not act for ends except insofar as they are a part of God's plan, and as such act according to the laws God implemented into this engine, called the world, to carry out his purposes. In other words, non-intellectual and non-living things can be said to act for ends only from God's perspective.

163. *Ibid.*

164. *Ibid.*

That Boyle accepts Descartes' exclusively mechanistic view of the world is clear from his comparison of the world to a well-made clock. All the inanimate things in the world can be likened to the spring, the wheels, the balance, and other parts of a clock, acting according to the intention and design of the clock maker while at the same time completely unaware of that intention and design. The inanimate things in the world act for the attainment of ends unknown to them but intended and known by the wisest of all intellects. The situation is much like that of a domestic beast of burden turning a mill stone and grinding corn or wheat to make flour. It is acting for the purpose of making flour, but it does not know that.

In his answer to the fourth and final question (To what extent can the arguments from final causes be made use of by a philosopher of nature?) Boyle offers several precautionary measures for employing final cause arguments. Of these only one is of interest to us. It reveals Boyle's understanding of the task of a naturalist, and it may be summed up this way: it is permissible to study final causes only insofar as that study will not hinder the more important study of efficient causes.

If we consider further this piece of advice we cannot help but notice that there is really only a small and insignificant difference between Boyle and Descartes on the question of final causality. Even though Boyle criticizes Descartes for disallowing the study of final causes in physics, his allowing such a study makes little or no difference to his own understanding of the task of the philosopher of nature.

The following lines attest to that fact.

It is true, that to inquire to what purpose nature would have such or such effects produced, is a curiosity worthy of a rational creature, upon the score of his being so: but this is not the proper task of a naturalist, whose work, as he is such, is not so much to discover, why, as how, particular effects are produced. . . . And whereas the two scopes, that men are wont to aim at in the study of physics, are to understand how, and after what manner nature produces the phenomena we contemplate: and, in case it be

imitable by us, how we may, if occasion require, produce the like effect, or come as near it as may be: these ends cannot be attained by the bare knowledge of the final causes of things, nor of the general efficient: but to answer those aims, we must know the particular efficient, and the manner and progress of their operating, and what dispositions they either find or produce in the manner they work upon.¹⁶⁵

Boyle, like Descartes and Bacon, sees the *how* questions as more important than the *why* questions, and consequently the efficient causes as more important for a physicist than final causes. This view stems from the idea, common to all three philosophers, that utility is the driving force behind the quest for knowledge of nature, and from their primarily mechanistic understanding of the material universe.

Boyle illustrates his advice on the study of final causes with the example of a watch (an example of which the mechanists never seem to get tired). Is it not the case, he asks, that almost anyone can quickly become acquainted with the purpose of a watch? But by becoming thus acquainted they are nowhere near understanding the nature of a watch. In order to understand its nature one must come to know its inner workings, that is to say, one must come to know the mechanism of a watch. Such knowledge can only be acquired through the knowledge of particular efficient causes. The same is true in the study of nature.

What then is the true purpose of studying final causes? It is to come to admire the wisdom of the omniscient creator of the world. But the way to understand the world is through the inquiry into the efficient causes. In fact, says Boyle, by coming to understand the workings of efficient causes we will better understand the purposes of the wise author of nature. In other words, the study of efficient causes is a good prerequisite for the study of final causes. Thus the study of final causes does not, for Boyle, have any real value in physics. If we were to remove it, physics, as he understands it, would remain in tact. But "the neglect of efficient causes

165. *Ibid.* p. 443.

would render physiology useless."¹⁶⁶ On this point he is in agreement with both Bacon and Descartes, and for that reason he must be regarded as being in opposition to Aristotle and the Scholastics.

With this we conclude the study of the three modern philosophers of nature who reject Aristotelian teleology. Their reasons for rejecting it were only stated in this chapter. Finding out what these reasons are completes only half of the purpose of my project. The second half, though considerably more brief, is far more important. The reasons given by Bacon and Descartes for rejecting the study of final causes in physics, and Boyle's caution for using them, though not really for physics, are not such that they immediately make clear the rejection of Aristotle. Unfortunately none of the three philosophers engages in a discussion with Aristotle on his doctrine of final causality. They simply reject it. For that reason we cannot automatically assume that they understand his doctrine. We need to raise then the following question: Do they really understand what Aristotle means by final causality? A negative answer to this question will yield other questions the answers to which will shed some light on the historical problem of final causality. Let us, then, examine closely the reasons given by our three modern philosophers for dropping final causality out of physics with this question constantly in the forefront of our minds, and see what conclusions we can reach.

166. *Ibid.*

CHAPTER IV

A CRITICAL EXAMINATION OF THE REASONS GIVEN BY BACON, DESCARTES, AND BOYLE FOR REJECTING TELEOLOGY

For that which, before aught else, falls under apprehension, is *being*, the notion of which is included in all things whatsoever a man apprehends. Wherefore the first indemonstrable principle is that *the same thing cannot be affirmed and denied at the same time*, which is based on the notion of *being* and *not-being*; and on this principle all others are based, as is stated in *Metaph.* iv, text. 9.
ST. THOMAS AQUINAS. *Summa Theologiae*, I-II, 94, 2

A Critical Analysis of Bacon

Most of Bacon's difficulties with final causes can be summed up in this: the study of final causes gets in the way of the discovery of "physical causes", that is, material and efficient causes. For that reason final causes should be banished from physics. Aristotle, Bacon thinks, by including final causes in his physics, "made men rest in specious and shadowy causes, without ever searching in earnest after such as are real and truly physical."¹⁶⁷ The correction here, Bacon suggests, is to restrict physics to the study of material and efficient causes.

Here we must ask ourselves whether Bacon's proposed course of action is a good one. There are at least two reasons, in my judgment, why it is not. In defending my claim I will at the same time be offering my criticism of Bacon's rejection of final causality.

My first reason is this: When Bacon suggests that physicists should restrict themselves to the study of material and efficient causes while leaving out formal and final causes he is asking them to do something that cannot be done.¹⁶⁸ In other words, Bacon's suggestion amounts to nonsense.

167. *Advancement of Learning*, p. 165.

168. For the specific reasons see p. 71 § 2ff.

I said at the outset that the four causes are really answers to four questions: *Material cause* or that out of which a thing is is the answer to, *What is something going to be made of?* *Formal cause* or that into which a thing is is the answer to, *What is it that is being made?* *Efficient cause* or that by which a thing is is the answer to, *Who (or what) made it?* *Final cause* or that for the sake of which a thing is is the answer to, *What is it being made for?* or *Why is it being made?* None of these questions makes much sense unless we know what is meant by a *thing*. Because we are here engaged in physics, or a study of nature, we should be more precise and ask what is meant by a *natural thing*. Aristotle's answer is this: a natural thing is a composite of matter and form. The study of natural things, or physics, is therefore a study of immattered forms or informed matter. To try and separate a thing's matter from its form is to do away with that thing altogether because by disregarding its form we are neglecting that which is most important about it.

A clearer explanation of what Aristotle means by a form should perhaps be given. When we look out into the world we say that we see things. What we mean is that we see different kinds of things: humans, brute animals, plants, houses, automobiles, books, and so on. All these things have at least two things in common: they are material and they are things of a kind. If we ask ourselves, as philosophers do, *What makes these different material things the kind that they are?*, or, *Why are these things different from each other?*, we are asking a fundamental question.¹⁶⁹ It is clear, at least to Aristotle, that it cannot be something

169. It is not uncommon to hear children ask, "Daddy, what is this?" "Oh, that's a rabbit, dear." This question is sometimes followed by another question that seems very silly and nonsensical to adults: "But why, Daddy?" At this point a parent usually doesn't know what to say and hopes that a child is only asking, "Why do you call this a rabbit?" It is difficult to tell, of course, what the child is really asking, but the question is neither silly nor nonsensical. If we retain that child-like sense of wonder throughout adulthood we will ask the same question expecting to find a sensible answer.

purely material that makes them different from each other because being material is precisely what they have in common. Their difference must be accounted for by something immaterial. That is, the kind that a material thing is is owed to something immaterial. That something, says Aristotle, is its form. Form is also that which accounts for the fundamental difference between living and non-living material things. In the case of living things the form is called *soul* (*psyche*). To say that the formal cause is *that into which a thing is made*, is to say that matter out of which a thing is has taken on a particular form which makes it to be the kind it is. It is this composition of matter and form that constitutes a natural thing. What allows us to see things as things is precisely this composition which is owed to both material and formal causes, that is to say, to matter and form.

So when Bacon suggests that physicists should study only material and efficient causes, he is asking them to separate matter from form in their inquiry of natural things. He is asking them to do something that cannot be done. What is more, he denies the reality of such a thing as form. This is clear from what he says in *Novum Organum*, book I, aphorism 5: "for forms are figments of the human mind, unless you will call those laws of action forms." Bacon is, in effect, saying that it is possible and necessary to study, in physics, natural things exclusively in terms of their materiality.

But the material cause of a thing tells us nothing more than that it is made up of matter, and matter, Aristotle says, is unintelligible. Never in our experience do we come across pure matter; we only encounter particular material things.¹⁷⁰ What

170. This is also true of the modern physicists who encounter "primary particles." If by these we mean molecules and atoms as well as electrons, protons, and neutrons, we must still admit that these are things of a kind, and that therefore there is a cause of their kind. In Aristotelian tradition that cause is their form. Now the fact the some modern physicists conduct their studies without paying attention to forms does not make their study invalid. It does, however, make their explanations of material things incomplete.

makes them knowable is not their materiality, but their form. We know that a great number of material things at one time were not. This does not mean, however, that the matter out of which the material things are made did not exist before they did. My car, for example, did not exist ten years ago, but the matter out of which it is made did exist. It is precisely because the matter did exist that it was possible for the carmaker to make my car. It was not enough, however, simply to pile up the metal, plastic, and rubber for my car to be a car. Something else had to be done to that matter to make it into what it now is. It had to have been given the form of my car for it to be a car.¹⁷¹ Once that form was given to the pile of metal, plastic, and rubber it became an intelligible thing. That is, it became a thing of a kind. I can now recognize it as my car. Note also that the pile of metal, plastic, and rubber that was potentially my car was also potentially many other things. It could have been a motorcycle, a snowmobile, a tractor, and so on. The car became actually what it is when it received its form. That is why Aristotle calls the form the actuating principle of a thing, and matter the potential principle. My car will sooner or later no longer be a car. But the matter out of which it is made will remain. What that matter will be we cannot know until it receives another form.

Aristotle was convinced that the same is true of natural things. A rabbit is different from an oak and a rock because it has a form different from that of an oak and a rock, and that is why it is known as a rabbit rather than an oak or a rock. It came, at one time, to be, and will at another time cease to be. The matter out of which it is formed will continue to be just as it was before the rabbit was. It may become a part of a wolf that devoured it, or part of some plants that were fertilized

171. In other words, the form is that which is responsible for unifying different things or parts of things, both quantitative and qualitative. Thus, for example, that which makes the parts of my car to be a car is their arrangement, their form.

by it, but whatever it may become it will not be that rabbit.

To conclude then, a thing is knowable solely because it is a thing of a kind, and the kind it is it owes to its form. A thing of no kind is nothing; were it to exist, by hypothesis, it would be thoroughly unintelligible. To say that we should study matter¹⁷² alone and to deny the reality of the form is to say that we should study the potential principle of a thing that is not yet in existence. This again would be to study nothing--*no thing*.

Bacon, of course, does not say this, but his suggestion amounts to exactly that. Interestingly enough he says, "physics regards the things which are wholly immersed in matter."¹⁷³ What are these *things*? Material and efficient causes cannot tell us. Only the formal cause can. Bacon's way of expressing himself betrays the correct way of thinking that he denies. Aristotle would wholeheartedly agree that physics studies things immersed in matter. These "things" are forms immersed in matter, or immattered forms. He would, of course, have been puzzled by the word "wholly", as if "partially" were an option. No form of a natural thing, human psyche excepted, is only partially, or incompletely, immattered. It would not make any sense to talk that way. Bacon may have been thinking that by inserting the word "wholly" into his statement he had denied the immateriality of natural things, but it is hard to see how that could be. We can only make sense of his statement if we understand him to mean that natural things are purely material: that there is nothing more to them than matter.¹⁷⁴ If it is true that natural things are purely material, why are they things?, that is, why are they things of a kind?

172. However different Bacon's conception of matter may be from Aristotle's, I doubt Bacon would deny that matter is that out of which a material thing is.

173. *Advancement of Learning*, p. 147.

174. It is true that Bacon speaks of formal causes, but he does not mean by that what Aristotle meant. He calls them "fixed laws," (see, p. 52 above.)

Bacon simply never asks himself this fundamental question. He just takes it for granted that things are the kind they are without bothering to ask about the cause of a thing's kind.

It is no surprise, then, that he banishes final causes from his formless physics. For Aristotle formal causality is closely intertwined with final causality.¹⁷⁵ The form is the plan of structure¹⁷⁶ which informs a natural thing. The final cause is also that plan, but prior to the actual embodiment of it in the thing. It is the plan which nature aims at. If there is no plan of structure, if there is no form, and for Bacon there is not, then there can be no intrinsic final cause. But if there is no form there is no thing of a kind, and consequently there is no thing. But obviously there are things. The philosopher is interested in knowing why there are things rather than no things, and why the things that are are the kind that they are. To the second question Aristotle seems to have given the right answer.¹⁷⁷

Bacon has said nothing that might convince us that the forms are just "figments of the human mind." He has not offered us an alternative explanation that would account for the difference between the kinds of material things, or even for the kind of a single thing. He has simply denied the reality of the forms and substituted for them his "fixed laws" without giving us a justification for the substitution. For that reason his rejection of final causality as the intrinsic principle of nature cannot really be taken seriously, nor can it be said that finalism has been undermined by any of Bacon's arguments. He has not given us any.

175. The same is true of efficient causality. See pp. 22 and 23 above.

176. Modern science has come a long way in showing us what the structure of a material thing looks like by discovering molecular structures. But by doing that it has not given us the *why* of the structure. It is true that scientists understand a great deal about how molecules form; they've come to recognize certain properties of atoms that enable them to join together in various ways and form different kinds of molecules. But the cause of the properties of atoms still remains to be discovered.

177. Aquinas had given the right answer to the first question with his doctrine of *esse*. See above the section on Aquinas.

Bacon may feel inclined at this point to object that he has given a reason for banishing final causality: "inquiry into final causes is sterile, and like a virgin consecrated to God, produces nothing." In other words, because final causes are useless they should be left alone by physicists. This brings me to the second reason for saying that Bacon's restriction of physics to the study of material and efficient causes is misguided.

The reason is this: Relegating formal and final causes to metaphysics (in Bacon's sense of the term) is a result of excessive and unjustified fear that the study of these causes will necessarily hinder the study of material and efficient causes and thereby prevent practical new inventions useful to man.

Let us consider further Bacon's objection to formal causality. By saying that forms, in the Aristotelian sense, are just figments of the human mind, Bacon is implying that they are abstract notions and as such have nothing to do with reality. The claim that a thing is what it is by virtue of its form is a feeble attempt to get a firm grasp on the runaway contents of sense experience. Constructing abstract concepts is something the mind does to avoid losing itself in the images it forms of natural things. We must be careful not to attribute to these abstract concepts the status of reality. Thus, in Bacon's view, the form of "man" must not be seen as part of the nature of man, but only as an abstract notion. For that reason a good physicist will not get himself tangled up in these unreal concepts, and will instead focus on the causes that are "real and truly physical." If physics is the domain of the real, it is superior to metaphysics.

There are two points that must be made by way of a response. First, Aristotle's forms do not appear to be the result of his attempt to get a fix on the unstable contents of his sensible experience. They are a result of his trying to de-

termine what makes things what they are, that is, the kind that they are. It was clear to him that each thing is a thing of a kind. He had no trouble seeing that. In other words, his mind was not groping to find its way in its images. The distinctiveness of each image was clear to him without first formulating the concept of formal causality. What troubled him was the cause of each thing's distinctiveness. Its form is the answer. Bacon's charge that forms are figments of the mind is simply not on. The forms, like matter, agent, and end, are what the mind discovers, not something it conjures up to help itself get oriented.

Secondly, when we ask Bacon why he thinks physics to be superior to metaphysics we get the following answer: "physical causes shed light on new initiatives *in simili materia*."¹⁷⁸ What he means is expressed well by Gilson.

physical knowledge of the material cause makes new inventions possible, while abstract knowledge of the formal cause is useless so far as practical consequences are conceived. It does not tell us how beings act, function, or live. Since they do not tell "how things work," formal concepts do not suggest any way of making machines capable of functioning and of producing in their turn other objects. Contemporary surgery illustrates remarkably this notion: an extremely exact knowledge of the actual heart and its functioning is the necessary, if not the sufficient, condition for the fabrication of artificial hearts capable of correctly taking up the function of the real ones.¹⁷⁹

Physics, as Bacon envisions it, is superior to metaphysics because it yields practical knowledge which in turn helps in production of beneficial inventions. Because formal and final causes are of no use to this end there is no reason why we shouldn't leave them out of physics. We are also quite right, Bacon thinks, in blaming the ancients for misplacing the study of final causes.

Now Bacon is absolutely right in this only if practical utility is the criterion of philosophical and scientific truth. But like Descartes he simply takes it for granted that it is and thereby grants primacy of action over contemplation. This move, as soon as it is made, immediately undermines Aristotelian philosophy of nature. For

178. F. Bacon, *Advancement of Learning*, II, 7, 6.

179. *From Aristotle to Darwin*, p. 23.

that reason we may rightly ask for the justification of such a move. None, however, is offered. To dismiss Aristotle's physics on the grounds that it has no practical utility is not an argument against it. It certainly is no argument for the unreality of final causes. Bacon, in fact, does not even deny their reality in nature. They must still, therefore, be taken into consideration in his scheme of knowledge.

If we suppose that Bacon is not out to discredit completely Aristotelian physics, we may assume that he wishes to improve upon it. It seems that this is his objective, and the way to do this is to relegate the study of final causes to their proper place, out of physics and into metaphysics. Bacon, upon his consideration of the history of physics notices that the contemplation of final causes had retarded scientific research. The ancients, preoccupied with the beauty of the end towards which each natural thing tends, have neglected nature's physical structure. Many of them confused the understanding of nature with admiring it. In order to prevent this error from recurring Bacon suggests that we leave final causes out of physics where they have been misplaced all this time. It seems that this is the real reason behind Bacon's banishment of final causes.

But this is not a very good reason, especially if we admit the reality of final causes. There is no reason why the inquiry into the physical structure of nature must be impeded by the consideration of final causes. The two are not mutually incompatible. The fact that the ancients have largely neglected to study the function of natural things is not the fault of their inquiry into the final causes. It is a matter of priorities. They were simply more interested in the ends of things than in their inner workings. If now we wish to pay attention to the function of things, that is no reason to neglect the ends towards which they tend, especially if we admit that they do tend to their ends. It would be foolish to rob ourselves of half

the truth for the sake of the other half. At any rate, such a move would not constitute progress.

Bacon's proposal to abandon the study of final causes can only be seen as a result of his unjustified fear that such a study would necessarily hinder the study of material and efficient causes. He does not show that there is a necessary link between the study of final causes and the neglect of utility. The claim that final causes are scientifically sterile is no argument at all. The ancients were fully aware that the study of final causes yields no practical results. They did not study them in hopes of extracting from them practical applications. They studied them simply because they exist. Their inquisitive spirit was ignited by the sense of wonder, not by the desire to "render themselves the masters and possessors of nature." For that reason they would never identify truth with utility. Truth meant for them the showing of what is, not the showing of what they could do with what is.

A Critical Analysis of Descartes

There is a fundamental assumption underlying all of Descartes' reasons for rejecting final causes. It is this: final causes are the ends of God. It seems that Descartes understands final causes to be the purposes that God intended for every single thing he created. I say it *seems* to be the case because Descartes does not really treat final causes as a topic; he does not come out and say, "This is what I think final causes are." But whenever he talks about them he refers to them as God's purposes.

His position on God's purposes has two sides that at first glance do not appear compatible. This apparent dichotomy can be seen most clearly in the section I quoted above¹⁸⁰ from the conversation with Burman. Descartes sees God's pur-

poses, on the one hand, as unknowable by us, that is, hidden from us "in the abyss of God's inscrutable wisdom." It would be rash therefore for us to plunge into them. By "us" Descartes means philosophers, not religious believers. He appears willing to allow the knowledge of some of God's purposes through revelation. But when we as philosophers consider God's ends all we are doing is anthropomorphizing God. "We think of God as a sort of superman, who thinks up such and such a scheme, and tries to realize it by such and such means. This is clearly quite unworthy of God." After reading this we are left asking, Are there or are there not any of God's purposes manifested in nature? It looks as though, at first, Descartes says there are but that they are hidden from us. But then, as we read on, he seems to be saying that for philosophers there are not any, or, at least, there should not be any. Philosopher should disregard all knowledge from revelation and stick only to what they can learn with their unaided reason¹⁸⁰. When they approach the matter that way there no longer seems to be a possibility of talking about God's purposes, that is, attributing purposes to God would be impious because God is above a purpose-carrying-out activity. But if he is above such an activity, how can we say that he has them at all? Descartes seems to be suggesting that, although God has purposes, his ways of carrying them out are unknown to us. He is charging the philosophers who employ arguments from final causes with falsely claiming to have penetrated God's secret ways of carrying out his purposes. This may be true of some philosophers in Descartes' day, but it is not true of Aristotle or Aquinas.

Given that this is how Descartes is conceiving of final causes, there are two avenues open to us for criticizing of his rejection of them. One is the avenue that

180. See pp. 58-59.

181. Descartes seems not to take seriously St. Thomas' claim that one truth cannot contradict another. One is reminded of the mediæval Arabic concept of the two swords theory of truth.

Robert Boyle takes when he argues for the knowability of some final causes in nature. This approach requires an agreement with Descartes that final causes are synonymous with God's intended purposes that are instilled, so to speak, by him into the mechanism of his creatures. Another possible approach is to call into question the understanding of final causes as the ends of God. The latter approach is the one I will take.

When reading Descartes' comments on final causality one cannot help but notice that his conception of it is in some ways different from that of the ancients. We never see Aristotle talking about final causes as the ends of The Prime Mover. Aquinas, when he is discussing final causes, never claims to have penetrated God's deep purposes. Why, then, does Descartes speak of final causes in the way in which he does? It cannot be because he inherited his understanding of them from Aristotle and Aquinas. Was he working with an understanding that is particularly his own? Has there been a significant shift in the understanding of final causes that took place sometime between the end of the thirteenth and the beginning of the seventeenth century that Descartes inherited? These questions would best be answered by historians of philosophy. Whatever the correct answers may be one thing seems certain: Descartes' conception of final causality is different from that of Aristotle and of Aquinas. For that reason we cannot conclude that he succeeded in proving them wrong.

My criticism of Descartes' rejection of final causality will consist mainly of showing that he does not address himself to Aristotle's and Aquinas' doctrines. He does say, however, that Aristotle's greatest fault is his "constant practice of arguing from ends." Some understanding, on Descartes' part, of what that practice is would be required to make his charge stick. I am not at all certain, however,

that he has an accurate understanding of it, nor does he show an understanding of the Christian version of the doctrine of final causality as articulated by Aquinas.

Let us begin with Aristotle's doctrine. Cartesian scholars often point out that Descartes' arguments against final cause explanations are tied up with his rejection of substantial forms. Strangely enough, none of the texts we have looked at, where he discusses final causes, mention substantial forms. Francis Bacon made his position on this topic clear when he pronounced the forms to be the figments of the human mind. But Descartes does not mention them in his arguments against final causes which he constructs along different lines altogether. This is curious, to say the least, because Descartes thinks Aristotle's greatest mistake was to argue from ends. If he wanted to discredit such arguments, the best place to begin would be with the substantial forms, not with the ends of God which Aristotle never mentions.

The substantial forms are the cornerstone of Aristotle's doctrine of finality. I have already pointed out that the concept of form is essential to Aristotle's doctrine of finality, and I have explained just how the form plays that all important role. But I did not say anything about *substantial forms*. Aristotle does not mean by the term anything other than what I have already said about *form* (I could have employed the term *essential form* instead). It is merely a name whose meaning is derived from his meaning of *substance*. By *substance* Aristotle means that which exists through or in itself, that is, that which does not exist as an aspect of anything else. A human foot is not a substance, but a human person is. A *substantial form*, then, is the form of that which exists in itself and not in another, to put it in another way, a *substantial form* is the *essential form* of a substance.

There are two arguments for the reality of substantial forms. I could not ex-

press them better than F. J. Collingwood does, and even though he does it in a rather lengthy manner I will reproduce here his text.

The first . . . [arises out of] the necessity of a unifying principle to account for the being found together in one composite of properties which do not of themselves entail one another. The second argument is based upon the non-substantiality of quantity, quality and change. Change, in the forms of qualitative alteration, growth, and locomotion is always a change of something that alters or is altered, that grows or that moves. Similarly qualities, colors, sounds, shapes, sizes, tastes, textures, and the like are all qualities of that in which they are; they are all qualities of some extended thing. As far as our sense knowledge is concerned, there is nothing else to a material thing than quantity and qualities. The quantity aspect appears to the senses as the more stable element for some quantity is always present even though qualities may appear and disappear. . . . Since no one of the aspects of material things that are directly apprehended by the senses does exist by itself, and since quantity, in which quality exists, cannot be said to then exist in quality, it must be said to exist in material substance.

This fact can be expressed in another way: since the quantity possessed by a specific thing, by a lion or by a molecule of water, is such a quantity because of the thing of which it is the quantity, it follows that the quantity exists as an aspect of the substance. Thus, the basic reality in a quantified thing, which accounts in some mysterious way for both the qualitative appearances and also for the definite quantity of that thing, is the deep-rooted principle of unity in the thing, the substantial nature of the thing. The qualities and activities which are always found in given material substance will indicate to some extent what kind of thing it is, and will manifest how it differs from other substances not having the same qualities and activities. [Collingwood is quick to point out with a footnote that "There is of course no implication intended here that by singling out the substantial aspect of a physical thing we thereby know its substantial nature."¹⁸²]

Two new notions have been arrived at by reasoning about the evidence obtained by the senses. The first is that of a unifying principle which holds together in one organization both quantitative parts and diverse qualities and activities. This unifying principle is called *essential form*, for by it is meant that factor in a thing by which it is diverse from other things. Of course it is also a means of classifying things that are essentially the same. Thus all living things are essentially the same inasmuch as they all possess self-motion, and they are not the same as non-living things, that do not possess the motion of this kind. The second new notion complements the first, for the notion of a distinct substance involves the possession of a distinct *substantial form*. The human intellect then in reasoning about the reality first manifested to the senses deduces the presence of a unifying principle which is not itself evident to the senses and to which the act of independent existence belongs.¹⁸²

This, then, is what is meant by *substantial forms*, and it is this that Descartes denies when he says "I even went so far as expressly to assume that there was in it [the world] none of these forms or qualities which are so debated in the Schools."¹⁸³ He characterizes the forms elsewhere as "occult forces" and as "stupendous and miraculous sympathies and antipathies."¹⁸⁴ It is interesting that

182. Francis J. Collingwood, *Philosophy of Nature*, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1961, pp. 98-100.

183. *Discourse on Method*, Part V.

Descartes says he *assumed* that there are no such things as forms. His denial of forms is not a result of some convincing argument proving their non-existence. It is rather the case that, after having conceived his method of philosophic inquiry in the manner in which he did, he had no use for formal and final causes. It is because he was certain that "nothing in the whole universe need be referred to anything but purely physical causes--i.e., ones completely independent of mind and thought."¹⁸⁴ that formal and final causes found no place in his philosophy. Formal causes, as we've just seen Collingwood point out, are not evident to the senses but can only be arrived at through a reasoning process. This is a point that we saw Aristotle making earlier. Only to a philosopher can the reality of formal, and therefore of final causes as well, be revealed.

Aristotle was so convinced of the teleological principle in nature that he wondered how his predecessors could have missed it, or worse yet, denied its presence. The only reason he could give for their error is that they were mistaken about the notions of matter and substance.¹⁸⁵ We can be sure that Aristotle, if he were confronted by Descartes' criticism of final causality, would, in his defense, point to his own doctrine of substance. If we understand material substance to be a unity of matter and form, we cannot but accept the doctrine of finality. The history of western philosophy bears witness to the fact that so long as substance was understood in this way Aristotelian teleology remained in tact. It was not until the seventeenth century with Bacon in England and Descartes on the continent that substance comes to be understood in a new way, that is, no longer as a composite of matter and form. As soon as the notion of substantial form was denied, the notion

184. *Principles of Philosophy*, IV, 187.

185. *Ibid.*

186. See Aristotle's *On the Parts of Animals*, I.1.

of final causality in the Aristotelian sense, as an intrinsic principle of nature, became inconceivable. But on what grounds, we may ask, has it been denied?

We must be careful when asking Descartes this question. We cannot expect of him to give us an argument against substantial forms from the perspective of Aristotelian physics. Descartes is not interested simply in improving upon Aristotle, his "ambition was quite different: it was to replace him."¹⁸⁷ This ambition arose primarily out of his dissatisfaction with the Scholasticism of the fifteenth and the sixteenth centuries. It seemed to him that the Aristotelians of his day were philosophically washed up. Something radically new and different had to be tried, something that would yield indisputable certainty. Philosophy as it was done up to the time of Descartes always left room for doubt. Its principles were never so certain as to exclude all possibility of being refuted. There was only one science that could claim such certainty: mathematics. Convinced that mathematics is knowledge proper Descartes concluded, "not, indeed, that arithmetic and geometry are the sole sciences to be studied, but only that in our search for the direct road towards truth, we should busy ourselves with no object about which we cannot attain a certitude equal to that of the demonstrations of arithmetic and geometry."¹⁸⁸

Armed with this principle Descartes set out to build his philosophy. We can watch this building process in his *Meditations*. When in the sixth *Meditation*, he finally comes to proving the existence of material things it becomes clear that what he is really interested in proving is not so much that things exist outside the mind, but rather that what does exist outside the mind is geometrical extension.

187. Etienne Gilson, *The Unity of Philosophical Experience*, Charles Scribner's Sons, New York, 1952, p. 125. I am relying on Gilson's work for this part of my criticism of Descartes.

188. R. M. Eaton, *Descartes Selections*, Scribners, New York, 1927, pp. 43-44.

For Descartes, there are really only three things that, at bottom, comprise reality: thought, extension, and God. His doctrine of the mind-body distinction aims primarily at showing that thought and extension are mutually exclusive, that is, that there is nothing in corporeal matter that belongs to the nature of the mind, and vice versa. This means that the material things out there have nothing about them that is mind-like. It follows that matter is nothing but extension, or that material things have nothing more to them than extension according to the three spatial dimensions.

If such is the nature of material things, apprehending them means apprehending them as objects of mathematics. We can no longer attribute to them the so-called *qualities* like weight, texture, colour, and so on. These do not arise out of extension alone, and they cannot, therefore, be said to belong to bodies. For the same reason we cannot attribute to them the so-called *forms* or *natures*. These were supposed by Aristotelians to exist in living and non-living bodies as the causes of their motion, generation, and sensations. But these cannot really be said to comprise the nature of extension. They are nothing but the falsely attributed "occult qualities", or fake souls, that man as a composite of body and soul wants to attribute to other things. But this is an illusion that only mathematical philosophy can cure.

There is another reason why Descartes found no use for substantial forms. It has to do with his conception of motion. In order to make his physics coherent Descartes needs only one metaphysical hypothesis, and it is here that he finds God useful for his philosophy¹⁸⁹. He needs God as the creator of matter and as a cause of certain amount of movement in it. Now because God is immutable and perfect

189. Pascal goes so far as to say that this is the *only* use Descartes had for God in his philosophy, and that he would have been quite willing, if it were possible, to leave out God altogether.

it means that the amount of motion that he put into the world when he created it must remain constant at all times. Moving bodies, therefore, as far as they can, move as they were once moved, and keep all of their motion when they collide with stronger bodies. When they collide with weaker bodies they communicate to them the amount of motion they lost at the point of collision. It is important to see that such motion does not come from within the bodies. To say that it does would be inconsistent with mechanism. It would also mean a regress to the fictitious forms of the Scholastics who maintained that a thing's form animates it from within and is responsible for its motion and rest. Descartes' idea of motion is purely geometrical and as such is nothing but a change of place. In other words, it is the "transference of one part of matter or one body from the vicinity of those bodies that are in immediate contact with it, and which we regard as in repose, into the vicinity of others."¹⁹⁰ Descartes thus regards motion as *transportation* rather than as force or action that transports because for him "motion is always in the mobile thing, not in that which moves."¹⁹¹

What Descartes has done may perhaps be seen more clearly if we recall the mediæval conception of the material world. Aquinas, following Aristotle, saw the world as made up of forms or natures which he regarded as energies or acts. It was these acts that caused the motions and various other operations in the bodies. Descartes who wanted to interpret the material world in purely mechanical terms, could not accept these forms in things as real because they do not lend themselves to being measured and numbered the way geometrical extensions do. To admit the reality of forms would be to allow for confused and obscure elements in nature. A mathematical philosopher who wants only extension and a constant amount of mo-

190. *Principles of Philosophy*, II, 25.

191. *Ibid.*

tion cannot allow for such an annoyance. That is why we see Descartes simply dismissing the substantial forms rather than really arguing against their existence. To agree with him on this matter we only need to accept his philosophical principles as the true principles.

But do have to accept his principles? Are they so self-evidently true that rejecting them amounts to foolishness? The answer, of course, is no, and there are at least two reasons for it. The first reason is best expressed by Gilson.

... the *I think, hence I am* is the first principle of Descartes' philosophy, but it is his pledge to mathematical evidence that led Descartes to the *I think*. This, I am afraid, was one of those initial decisions, which beget systems of philosophy where everything is conclusively justified, except their very principle. If we need a philosophy whose certitude is equal to that of mathematics, our first principle will have to be the *I think*; but do we need such a philosophy? And supposing we do, can we have it? In other words, are we sure that everything that *is* is susceptible of a mathematically evident interpretation? The answer, of course, is arbitrary. You have a full right to bet on the affirmative, but it is gambling, and if by any chance you happen to be wrong, you will be playing a losing game from beginning to the end. Everything will be mathematically proved in your philosophy, save only this, that everything can, and must be, mathematically proved.¹⁹²

The first reason, then, for rejecting Descartes' mathematical principles is that they are not necessarily true, but rather must be, like the starting principles of other philosophical systems, assumed from the beginning. But the certainty for which Descartes yearns so much cannot be said to apply to his method of acquiring it.

Secondly, when we look at the history of philosophy and science we see that Cartesianism was doomed to an early collapse. Some evidence of this should have been clear to Descartes himself when he read W. Harvey's book on the circulation of blood. Harvey's explanation of the motion of the heart is incompatible with Descartes' mechanical biology, and yet he recognized it as a true explanation. But strangely enough this did not help him see the inadequacy of his mechanism. In the field of physics came another blow. Even before Descartes' death Leibniz was already born, and he was to prove that Descartes' laws of motion were mathemati-

192. Gilson, *The Unity of Philosophical Experience*, pp. 132-133.

cally wrong thus showing the scientific worthlessness of Descartes' physics.

All this is enough to justify a rejection of Descartes' philosophical principles. There is enough evidence here to support the claim that Descartes' mathematical explanations did not successfully replace Aristotle's physics and his substantial forms. It cannot be said, therefore, that Descartes' mechanism had done away with Aristotle's finality. Now, because we have not seen Descartes argue against finality by arguing against the substantial forms there is a puzzle that remains unsolved. It is this: Did Descartes fully understand Aristotle's doctrine of finality? It is very difficult to give a precise answer. I, for one, am not so sure he did. Nearly¹⁹³ all of his criticisms of finality revolve around his claim that the ends of God are unknowable (not just unknown) by man. This suggests that Descartes was working with a Christian idea of finality more so than he was with the Aristotelian one. And this brings me to the second element of my criticism of Descartes' rejection of finality.

If it is true that Descartes' conception¹⁹⁴ of finality is primarily a Christian one, is it truly Christian? The best way to find out is to compare it to the doctrine of the Christian Doctor himself, St. Thomas Aquinas. The fact that Descartes finds it so easy to replace all arguments for the existence of God from finality with arguments from efficiency, suggests that his understanding of finality is different from Aquinas'. Thus if we allow for the existence of order in the world we can inquire about the cause of this order. We need not pretend that it is a perfect order, but no matter how little of it there may be we can still look for its cause. All that we need for the proofs from finality is a "physico-biological mechanism with an orienta-

193. In his conversation with Burman, Descartes rejects arguments from final causality because the knowledge of a thing's purpose tells us nothing about that nature of that thing. See pp. 58-59 above.

194. I am not saying that this was Descartes' doctrine. It is clear that he did not want to have anything to do with it. I am interested in the form of the doctrine Descartes was criticizing.

tion: and we ask at once, whence comes this orientation?"¹⁹⁵ This question, says Gilson, is a double question. The first seeks to discover the cause of the "wonders of nature."¹⁹⁶ This dead end question can at best only lead us to some superhuman engineer of the world. Inquiring about his purposes or ends is what this kind of silly finalism does, and it is this kind of finalism that Descartes is opposed to. He sets up his mechanism against just this kind of finalism which suggests that his understanding of final causality is precisely of that sort. There is no *a priori* reason why animals could not be manufactured, and so by inquiring into the mechanical laws of physics we can come to know all we need to know about a natural thing. There is no need to get into some hidden purposes of the engineer. If this were all there were to the doctrine of finality Descartes' rejection of it would be quite justified, and he would be right in saying that proofs for God's existence from efficiency are enough. But what our question is really asking is this: if there is order in the world, what is the cause of the *existence* of this order?

The question must be understood properly or we will miss its point. The mechanists, when they are considering this question, are operating on the level of making rather than creating. What is the difference? The creator gives to his creature its existence, or being, as well as its arrangement, the maker gives it only its arrangement. The mechanists of the seventeenth and eighteenth centuries, when they employ their famous example of the watch-maker, seem to be operating on the level of making. Gilson explains their error in the following way.

Just as, whenever we observe an artificial arrangement, we infer the existence of an artificer as the sole conceivable sufficient reason of the arrangement [thus the proof for God's existence from efficiency], so also when we observe over and above the being of

195. Etienne Gilson, *The Spirit of Medieval Philosophy*, University of Notre Dame Press, 1991, p. 78.

196. This is precisely what Robert Boyle does when he criticizes Descartes, and that is why, as we will see in a moment, his criticism is not very effective.

things, an order between the things, we infer the existence of the supreme orderer[thus the proof from finality]. But what we have to consider in this orderer is not so much the ingenuity displayed in the work, the precise nature of which too often, possibly always, escapes us, but the causality whereby he confers being on order.¹⁹⁷

The error that Descartes saw clearly is the attempt to penetrate God's purposes by focusing on the ingenuity displayed in his work. The finalism that Descartes is opposed to is interested in the purposes of the maker. But Thomistic finalism is not interested in discovering God's ends, or as Gilson calls it, "God's legislation," that is, his Providence. St. Thomas does not pretend that by proving the existence of God's legislation he has uncovered its secrets. "It is enough to know that legislation exists, for if so, it appertains to being, that is to say either to contingent being which cannot explain itself, or to necessary being which, while sufficient to itself, suffices also as the reason of the contingent that derives from it."¹⁹⁸ And, with a little more work we have the proof for God's existence from finality that cannot be replaced by a proof from efficiency.¹⁹⁹

But Descartes, as a philosopher, says that man cannot know that God's legislation exists. It is too deeply hidden from feeble intellect. How then do we come to talk about it at all? How can it be known through revelation? Is it not the human intellect that knows God's legislation through revelation? Of course it is and Descartes would say so himself. The mind cannot, then, be as feeble as Descartes would have us think. It can be assured of the existence of God's legislation if nothing else, and that can be done through a philosophical demonstration. But in order to make sense of such a demonstration we must rid ourselves of the exclusively mathematical principles of philosophy.

197. Gilson, *The Spirit of Medieval Philosophy*, p. 79.

198. *Ibid.*

199. It is not in my interest to recreate such an argument. But it can be found in St. Thomas' *Summa Theologiae*.

Cartesians may feel inclined at this point to object by saying that all this does not prove that a physicist should take into account final causes even if we understand them in their proper sense. They are still scientifically sterile, and tell us nothing about the nature of things. This may be true. But I have so far only been interested in finding out why some modern philosophers dropped final causality out of their physics. The answer with respect to Descartes seems to be that he was working with a notion of finality that can justifiably be rejected. My point, however, is that this is not the doctrine of finality as Aristotle and Aquinas understood it. Furthermore, Descartes' philosophical principles do not allow for the consideration of final causes properly understood because they cannot allow for the reality of substantial forms. His mechanistic explanation of the material universe finds no use for final causes because they do not tell us anything about the *how* of things. But this is not an argument against the reality of final causes, nor is it an argument for rejecting them in physics. The doctrine of final causality in its ancient form is thus untouched by modern criticisms. I will reserve the question of the scientific sterility of final causes and the possibility of their inclusion in physics for my concluding remarks.

A Criticism of Boyle's Account of Final Causality

It cannot properly be said that Boyle rejects teleology, but his teleology is not an Aristotelian one. He, like Descartes, thinks of final causes as the ends of God and accepts the mechanistic explanation of the material universe. For that reason my criticism of his position is the same as my criticism of Descartes' position. But I need not even employ it because Descartes' criticism of finality can be put right back to Boyle. Because Boyle's final causes are the causes of the "wonders

of nature" "they never introduce us to anything better than a kind of chief engineer of the universe, whose power, astonishing to us as our own is to a savage, remains, nevertheless, within the human order."²⁰⁰ Descartes is quite right in saying that such finalism is nothing more than an anthropomorphizing of God. For Boyle, as we saw, final causes are not intrinsic principles of nature but only principles of cognition. He does not see non-intellectual and non-living things as acting for an end, although they can be seen as intended by God for some purpose. But how God goes about carrying out his purposes remains hidden from us. Thus the study of final causes is really of no great import to a physicist. In fact, according to Boyle, she or he must be careful not to let considerations of final causes get in the way of the more important inquiry into efficient causes. In this respect Boyle is in agreement with both Bacon and Descartes. His criticism of Descartes is at bottom a charge of impiety and the Cartesians could easily throw it right back at him. The truth is Descartes and Boyle are both working with the same faulty understanding of finality and for that reason it cannot be said that finality is alive and well in the seventeenth century. It may be alive, but it certainly is not well.

Concluding Remarks

What, then, can we say is the reason why some modern philosophers dropped final causes out of their scientific inquiries? There are two main reasons that I can see. They are: utility and mechanism. These two words express the hallmark characteristics of modern philosophy during the seventeenth century. It is no surprise, then, that Francis Bacon, for whom truth and utility are synonymous, is so eager to relegate the study of final causes (the barren, that is, useless, virgins con-

200. Gilson, *The Spirit of Medieval Philosophy*, p. 78.

secrated to God) to his newly conceived discipline of metaphysics. Descartes, regarding Scholasticism as useless and therefore false, decides that *instead* of it he is going to look for a "practical philosophy by means of which . . . [we can] render ourselves masters and possessors of nature." His new practical philosophy turns out to be a mechanical philosophy, chiefly concerned with the efficient cause [*cause mecanique*]. Because this cause is the only one that gives us a handle on nature, it is for him the only one worth knowing. And finally, Robert Boyle, who in spite of his apparent interest in final causes, which, in his view, are nothing more than the causes of the "wonders of nature", advises physicists not to get too dazzled by them and neglect the far more important efficient causes. His disagreement with Descartes is not over the principles of philosophy, which he wholeheartedly accepts, but over how much can be known of God's purposes. Such knowledge, he admits, is only a knowledge of the *why* of things. The proper task of a naturalist is to "understand how, and after what manner nature produces the phænomena we contemplate: and, in case it be imitable by us, how we may, if occasion require, produce the like effect." To come to this understanding we need the knowledge of the "particular efficient."

But in all their strong emphasis on efficiency these moderns appear to be ignorant of the importance of finality. This importance is best expressed by Aquinas.

Now the first of all causes is the final cause. The reason of which is that matter does not receive form, save in so far as it is moved by an agent: for nothing reduces itself from potentiality to act. But an agent does not move except out of intention for an end. For if the agent were not determinate to some particular effect, it would not do one thing rather than another: consequently in order that it produce a determinate effect, it must, of necessity, be determined to some certain one, which has the nature of an end. And just as this determination is effected, in the rational nature, by the *rational appetite*, which is called the will: so, in other things, it is caused by their natural inclination, which is called the *natural appetite*.²⁰¹

Our three modern philosophers fail to see that the final cause is the cause of effi-

201. *Summa Theologiae*, I-II, 1.2.

cient cause's causality. In other words, efficient causes do not do what they do merely by virtue of being efficient causes. The understanding of efficient causality alone is not enough to understand its activity. I have explained this in more detail in the section on Aquinas.

This alone is enough not to drop final causes out of physics. Even if we prefer the mechanistic explanation of the material universe we still need final causes. But what are we to do about their scientific sterility and unintelligibility? These are among the chief modern complaints against final causes.

The answer is not far to be found. If the final causes are scientifically sterile, they are not so philosophically, provided, of course, that we do not equate philosophical knowledge with useful knowledge. The ancients never thought that final causes would aid them in their pursuit of practical knowledge. Rather these causes held a high place in their philosophies because they revealed to them the beauty of nature. Not simply the beauty one perceives with an eye, but the intelligible beauty which the mind perceives when it gazes upon the order that governs the structure and relations of forms. But again, such beauty can only be appreciated if our philosophy is not a utilitarian one, only if intellectual contemplation is regarded as the activity most fulfilling to us as persons. For Aristotle and his mediæval followers it was. That is why the modern charge against their employment of finality is simply not on. If the more ancient thinkers were utilitarian in their outlook, the charge may be understandable. It is altogether incomprehensible when it is laid against those for whom beauty is an end in itself, and not a means toward something else.

As far as the unintelligibility of final causes is concerned, this too is not something that arises within the framework of ancient philosophy. Final causes are in-

telligible only in so far as we admit the reality of substantial forms. If we do not, then even the efficient causes are unintelligible, as Malebranche and Hume clearly saw. In a universe completely mechanized, Comte noted, the very notion of cause is unintelligible leaving a scientist with nothing to do but to formulate laws. But in a world of Aristotle's forms and Aquinas' existential act of being as the highest and most perfect act, finality is at home. All three of our modern philosophers talk about final causality apart from these two principles. We cannot therefore conclude that their criticisms in any way undermine the real doctrine of final causality.

Finally, I want to point out that teleological explanations of the material universe do not exclude the possibility of mechanical explanations. The reverse is also true. There is no reason why the pursuits of the *how* questions cannot peacefully co-exist with the pursuits of the *why* questions. Descartes went too far when he wanted to put forward his philosophy *instead* of the Scholastic one. All he needed to do was to point out that efficient and material causes deserve more attention than Aristotle and the Scholastics gave it. The pursuit of practical knowledge need not replace the pursuit of speculative knowledge. The ancients recognized the legitimacy of both kinds; there is no reason why the moderns should not do so as well without, of course, putting them into completely isolated compartments.

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